

Utah System of Higher Education
Technology & Distance Education Initiative
Utah Electronic Community College
1999 Curriculum Development RFP

Hans G. Ehrbar

University of Utah

1	USHE 1999 Curriculum Development Proposal Cover Page		
1.	Applicant Institution:	University of Utah	
	Sponsoring Units:	Economics Department College of Social and Behavioral Sciences	
2.	Project Title:	Marxism and Critical Realism	
	Course Numbers:	Econ 5080 and Econ 7960	
	Units of Credit:	5080: 3 undergraduate credits; 7960: 3 graduate credits	
3.	Project Director:	Assoc. Prof. Dr. Dr. Hans G. Ehrbar	
	College/Unit:	Economics Department, University of Utah	
	Phone:	(801) 581 7797	
	Mail Drop:	308 BuC (1645 E. Central Campus Dr. Front, SLC UT 84112)	
	Email:	Hans.Ehrbar@m.cc.utah.edu	
	<p><i>Abstract:</i> An existing successful undergraduate email course uses an intelligent email list server. This allows thoughtful interchanges regarding difficult subjects. Emphasis is on <i>synchronization</i>, i.e., all participants read and discuss the same material at the same time, and <i>cooperation</i>, i.e., participants learn not only from the instructor but also from each other, in part by teaching each other. The class format is to be refined by</p> <ul style="list-style-type: none"> • the development of an automated guide through the rules of the course, • more publicity and democracy regarding grading (on a voluntary basis), <p>and a graduate seminar (also per email) is to be developed which supplements this undergraduate course.</p>		
5.	Budget Total:	\$23,520	USHE: \$17,760 Match: \$5,760
6.	Project Director:	Chief Academic Officer:	
	Date:		

2 Budget Summary

Project Title: Marxism and Critical Realism

Project Director: Hans G. Ehrbar

Total USHE Request: \$17,760

	USHE Funds	Dept. Match
Personnel: Release time 2 Classes \$6,000 each	\$9,000	\$3,000
Graduate Student Assistant for 2 Semesters	\$8,000	\$2,000
Scanner and Acrobat Capture	\$400	\$400
Megabit Connection home to University, 1 year	\$360	\$360
Total	\$17,760	\$5,760

3 Background and Significance

Since 1995, I have regularly taught an advanced undergraduate email course devoted to a close reading of Marx's *Capital*. Its home page is www.econ.utah.edu/ehrbar/ec5080.htm, but the primary medium for the course is not the www but email.

The course teaches the students to read a difficult philosophical text and opens fresh perspectives about our social and economic system. The method is simple: class participants answer selected study questions or write short papers about the assigned readings. These contributions are emailed to everyone in class, with the author's identity protected by a pseudonym. As instructor, I write detailed responses to the participants' submissions, which also go to everybody in class, and the participants are also encouraged to comment on each other's work. This course simulates one of the many scholarly email discussion groups on the internet, and the format guarantees that

every contribution receives careful individualized feedback.

The course tries to overcome the isolation which often comes with high technology courses. While giving the students a maximum of flexibility in scheduling their time, it also tries to *synchronize* their work, i.e., all participants read the same material during the same week and discuss it with each other; and although the class participants are not required to physically meet in the classroom, it tries to foster *collaboration* and allow participants to learn from each other, in part by teaching each other.

The details of the course format have evolved continuously since inception of this class. The present HETI proposal is on step in this evolution. It is designed to (1) remedy a certain *problem* that became apparent when this course was taught in the Spring Semester 1999, to (2) better exploit an *opportunity* opening from the success of the course, and to (3) introduce one complete *novelty* which will re-ignite excitement and provide new experiences.

This email course is one of the earliest courses using the new information technology. It has always been popular; the two sections in Spring 1999 had an initial enrollment of 70. It is a fun way for economics students to satisfy their writing requirements. The course is also known among Marxists around the world, and it establishes a reputation for the University of Utah.

4 Project Description

The objectives of the class are critical thinking, written communication, and cooperative learning, through participation in an email discussion list.

4.1 Technologies

The main vehicle for the class is an “intelligent” mailing list server, which not only redistributes mail but has a number of additional capabilities.

4.1.1 Features of the Mailing List Server

I will first list the features that already exist, although some of them have to be improved:

- The list server knows which email address is attached to which pseudonym, so that ordinary emails sent by the class participants to a designated address will be propagated to everyone in class, with the identity of the sender hidden behind by a pseudonym.
- The server also knows the study questions, so that the participants do not have to re-type the question, but they only have to specify the question number, and the email propagated to the class inserts the question text automatically.
- At the beginning of the Semester, these study questions are extracted automatically from the \LaTeX source code for the Study Guide www.econ.utah.edu/ehrbarr/akmc.pdf. The Study Guide was thoroughly revised every time the class was taught, and will eventually be published as a book.
- The list server also knows about the due dates of the assignments, and forwards only those submissions to the class which are on schedule.
- The list server keeps track of the grades given for those assignments, and knows the rules how to compile the final grade.

- Besides, it converts all email messages into typeset archives and places these archives on the www as pdf files and html files.
- The mailing list server also fulfils some important behind-the-scenes functions. It keeps the instructor informed about the submissions which still have to be answered and graded, and presents these submissions to him in an organized fashion (either chronologically or by question number), so that he can write responses to the participants' contributions.
- It also makes it easy for the instructor to jump to the place in the source code of the Study Guide where the current Question is discussed, so that he can review and edit the Annotations to Marx's text while working on the responses to the students.
- The server also generates, at the end of the class, a comprehensive compilation of every student's work and other information (the time profile of their participation etc.) so that the instructor can gain an overall view of the performance of the students.

Under the present proposal, the following enhancements are planned:

- The grading and scheduling abilities of the listserver will be streamlined using object oriented programming, so that it will be easier to modify the rules or introduce new ones, and so that the list server can generate, on demand, status reports for all students, which inform the students of their grades and advises them of the next deadlines to meet.
- The list server will allow the participants to cast advisory votes about the grades of their peers (more about this below).
- The server will be enabled to conduct also a different, more free-format class than the present one with the pre-determined Study Questions.

4.1.2 Programming Techniques

I had originally planned to work together with a special programmer for the course. But since I did not receive funding for a programmer, I had to do all the programming myself. This led to a tight integration between instructional strategies and programming, which I consider now one of the major strengths of this course. I intend to exploit these possibilities as far as they will go. How much can the students' learning experience be improved by the use of intelligent but unobtrusive automatic controls?

The software is written in `emacs-lisp`, the programming language associated with the GNU emacs editor, because I am using emacs anyway for everything I do, from writing my \TeX source files to reading mail to browsing the web, and also as a front end for running statistical software (Splus, SAS, etc.) In this way, the work on the class mailing list can be seamlessly integrated with my other work. My `emacs-lisp` package managing the class mailing list uses a number of other packages: `RMAIL`, `gnus`, `regi`, `supercite`, `bbdb`, `calendar`, and `w3`. With these resources at hand, the needed effects can be achieved with fairly compact code. I am coding with an emphasis on flexibility and adaptability, incorporating many redundant checks, so that I can discover quickly when I introduce errors through my continuous addition and modifications. Periodically I also streamline the code and improve its design, but the emphasis is on getting the required features working, not the cleanest design.

4.1.3 Instructional Strategies

One of the objectives of the proposal is to make it easier for the instructor to fine-tune the rules which the course participants have to follow, and to enable the participants to get information, on

demand, about their present standing and the deadlines and required assignments.

Here I'd like to explain first why the rules of the class are numerous and complex enough that this becomes an issue. The transcript www.econ.utah.edu/ehrbar/qa1999.pdf shows a lively discussion among the participants. This was not a spontaneous outcome. In order to facilitate interaction among the participants, I had to introduce many rules, which negotiate small behavioral concessions from each participant. These rules were designed to be fair and reasonable, to have only a small impact on the students' freedom to schedule time for this class whenever convenient, but cumulatively they enabled better forms of cooperation. The importance and the character of these interventions is best explained by examples:

Timing of the submissions within the week During the very first run of the course, many students submitted their assignments late, often with convincing excuses. These late submissions, if accepted, disrupted the ongoing discussion, and if rejected, strained the relationship between student and instructor. Therefore I set up the mailing list in such a way that answers to study questions not currently assigned would be automatically returned to the sender, without my intervention. The students receive a friendly automated notice telling them which assignments are accepted today, together with an explanation that these restrictions have the purpose to keep the discussion focused. This was accepted by the students and now the submissions are on time.

But even though the submissions are on time, the students made a habit of waiting until the last hour to send in their assignments. This made discussion impossible, because all submissions arrived simultaneously. In order to remedy this, I established the rule that everybody's submissions had to be *on the average* at least 24 hours before the deadline. In the first year of this rule, the students apparently did not believe that I would enforce it, and I had to duck the final grades of a

number of students because the timing of their submissions did not meet this average. Since then, the students have accepted and followed this rule.

This average rule seems simple enough, but in its implementation, details come up which make the issue surprisingly complicated:

- Sometimes I extend the deadlines for certain assignments by a day or two. In this case, it is usually fairer to still count the timeliness of the submission with respect to the original deadline, and to consider submissions received after the original deadline as submissions received 0 hours before the deadline. This complicates programming and housekeeping, because the computer has to know both the original and the actual deadline. But it is more important to have fair rules than to save some programming lines.
- Students are allowed and encouraged to send contributions to the list which do not receive grades. The inclusion of these ungraded submissions in the average calculation would open a loophole, since those students who fall behind in their average can just send little nothings to the list early in the week, which only have the purpose of boosting their average. I want to keep the mailing list as clear as possible of any kind of faked interactions, since they poison the atmosphere for those who are genuinely interested in the discussion. On the other hand, if I were to disregard ungraded contributions altogether, I would penalize those students who see their homework not as a one-shot deal but who make more than one contribution about the same subject, perhaps starting out with an ungraded contribution so that they can take more risks in answering the question. Therefore I am doing the following: ungraded contributions will be included in the average only if they are followed up by a graded contribution in the same week. Most students are not aware of this, but it prevents situations which the

students would consider unfair.

- After introduction of the average rule, a few students adopted the strategy of making one submission 5 days early and the other submissions on the evening of the last day. Therefore currently the rule is a measure which gives less emphasis to outliers than the average: all submissions more than two days early only get credited two days.

Pacing the Readings over the Semester In the classes taught before Spring 1999, every week a different passage of Marx's text was assigned for reading and discussion on the internet, with exception of the weeks before the two exams. This gave 8 different question assignments (there were also termpapers etc.) The class participants did not have to submit a homework in every week, but only in 6 out of the 8 weeks. In 1999 I adopted a finer grained structure, assigning two different readings every week, one from Monday to Wednesday, the other from Thursday to Sunday. The overall reading volume increased only moderately (since the course changed from 4 Quarter hours to 3 Semester hours), but it was cut into many more pieces: instead of 8 different assignments, the students now had 26 different assignments to choose from. They still had to make 6 homework submissions. And it was a bigger mailing list, because I taught the course in two sections simultaneously.

On the one hand, this helped the discussion: certain tricky issues which tended to fall through the cracks in the earlier classes came up now because the discussion was better focused. It also gave the students more flexibility. Indeed one might argue that they had too much flexibility now: since they had so many future opportunities, a number of students procrastinated getting started with the email discussion. In anticipation of this I had put in the following rule: if submissions

were made to two consecutive assignments, the second submission did not get a grade. This rule makes it impossible for the students to concentrate their homeworks for the whole Semester into a 3-week period. I understand now that this kind of rule is not the right incentive to break the threshold of difficulty and anxiety associated with the first contribution.

Since the class discussion started so slowly, I had to add, after the beginning of class, another rule that everybody had to make their first contribution within a specific time period after signing up to the class. This slow beginning also gave me time to respond in detail to those submissions that were made. Later I realized that many students read these comments very carefully. Instead of plunging in right away with their own messages, they used the first weeks to carefully observe how the submissions of their peers were received. The overall care and quality of the work throughout the Semester was quite high, since the first few weeks of slower but careful work set a precedent.

My new rule still did not generate enough traffic to avoid congestion at the end of the Semester. Therefore I temporarily relaxed the rule of contributing only to every other assignment in the weeks before the first exam, when students had to devote more time to the class anyway. This had good effects and was liked by the students.

I have come to the conclusion that there is nothing wrong if slow periods, in which the students have a small number of email contributions to digest, with lots of feedback on my part, alternate with faster-paced periods, in which there is more give and take among the students themselves. But I must insist that the students make at least one submission early on, in order to break their procrastination in face of a new and unfamiliar medium.

Other Issues Similar micro-issues come up about the formats of the exams, the preparation for the exams, the group term papers and what to do with students who do not find a group, the

requirement to comment on the work of other students, the other mailing list marxism-intro devoted to broader issues, what to do if there is a technical failure, etc.

4.1.4 Rules as a Scaffolding

These examples show how a set of simple and logical rules quickly inflates and becomes a complicated code similar to the tax laws, and that it is sometimes necessary to modify the rules during the Semester. Can this rule inflation be avoided? In an ideal setting, the class rules would be mere signposts indicating the general intended structure of the discussion, and class participants would modify them if they felt that the same objectives could be achieved in easier or better ways. But reality is far from this ideal, since students have to worry about their grades. A number of students are unconcerned about the overall objective of the class and use the rules as the framework for their private optimizations: how can they get the best grades for their effort while still staying within the rules. They follow a time-tested principle of success in a capitalist economy, extract private gain by degrading social resources. Others start out along more idealistic lines but get discouraged when they observe the blatant self-serving strategies of their peers.

What is the best response in this situation? I am in favor of an activist style of intervention, which tries to foreclose specific evasive strategies by modifying the rules. The purpose is not to design a bullet-proof set of rules which cannot be misused, but to set enough rules as a scaffolding so that a fruitful class discussion can arise. The class discussion itself will become the goal only after a precedent has been set, and this precedent will not come about spontaneously but must be fought for. The progress of the discussion climate in this class is cumulative: students know by word of mouth and from the web archive how this class works, and the past experience of a fruitful

cooperative discussion is a far better motivation than the most elaborate rule book.

Since every class is a little different, the rules need continuous modifications to accommodate the skills and preferred study style of the individuals presently in the class. As the class evolves and some of its goals are met, new rules become necessary, but other rules lose their importance. Example: First it is a struggle to get the students to comment on each other's work; only after enough students do this and it becomes accepted behavior, can we work on refining the tone and style of such comments.

This method of a fairly complex and furthermore also changeable set of rules has a major drawback: the high information requirements for the students to keep up with the rules. A detailed syllabus which lists all the rules is necessary but not sufficient. See the last dozen or so pages in the Study Guide. Students should not have to study a dozen densely printed pages in order to know what is required of them in class. Many students refuse to do this, and I cannot blame them. One of the three development goals for which this HETI grant is sought is to build an automated information system that guides the students through these rules. The software must recognize which aspect of the rule book is relevant to a given student, and inform him or her of actions they have to take in order to stay within the rules. This is an Artificial Intelligence (AI) project, and it is a fortunate coincidence that `emacs-lisp` is a flavor of `lisp`, which makes the implementation of object-oriented code easy, see for instance [6].

To give only one example of the programming envisioned here, *grades* must be represented by a special data structure. A grade can be either a letter or a number. But some assignments are obligatory yet they do not receive grades; their grade is, strictly speaking, a pass-fail grade, which requires a different treatment than a letter/number grade. Missing submissions should also

be treated differently; it is not good practice to identify a missed submission with an E. And if the students are allowed to inquire about their grades at any time, then submissions for which the instructor has not yet given a grade at the time of the inquiry must get a special treatment too. The data structure “grades” must have slots for all these cases, which have a bearing on how the grades are tallied and reported. I want to give the students interesting and useful information about their grades, with automatic “most likely” and “worst possible” predictions, because I want them to make their inquiries often. In this way I have the opportunity to tell them about any deadlines they are about to miss.

It should be emphasized here that I am not using AI to teach content, as some instructional software does. My efforts to teach the students content are documented in my responses to the student submissions in the class archives. The computer merely takes over certain trivial but tedious housekeeping chores, so that instructor and students are freed to engage in an old-fashioned discussion. This is what AI is good at. It can do an excellent job in guiding the students step by step through the course deadlines and requirements, whereas the time when AI will be able to teach them the fine points of critical thinking is still in the remote future.

4.1.5 Grading

The students see each other’s work, and they see the comments given by the instructor and other class participants, but they do not see the grades these assignments receive. This important piece of information is missing for privacy reasons. But since the identity of the author is already protected by a pseudonym, these privacy concerns are not as pressing as in other classes. Therefore the second major point in this proposal is to make the grades of those class participants, who agree to

it and are willing to sign a written release form, visible in the web archives, and also to discuss grades more explicitly, with an opportunity for the students to vote on the grades (which are not binding but advisory for the instructor).

It will be interesting to see how many class participants agree to having their grades made public, and what the discussion of the grades will bring. The instructor is put here on the spot, since it is very difficult to give unbiased grades. Perhaps the publicity can be a protection against unfair grades. Grades are part of the repressive mechanisms by which the capitalist system keeps its citizens in line, and grades make it difficult to get a good discussion going. I hope that an open discussion about grades will improve the course and also have an emancipatory effect for the students. This new feature will probably generate interest and excitement.

4.1.6 Development of Graduate Course about Marx's Method

Between 1995 and 1999, the quality of the course has steadily improved. The emphasis is not on acquiring factual knowledge, but on learning how to read, think, and communicate. The level of the course is high enough now that the course should be combined with a graduate seminar in which the issues coming up in a careful reading of Marx's *Capital* will be put in the context of the modern literature. The focus of this proposed graduate course will be Roy Bhaskar's *Dialectic: The Pulse of Freedom* [2], which is very important for understanding Marx's method, but which is an extremely difficult text. The graduate course will again be taught by an email discussion, with all course readings available on the www and also on CD-ROM. It will have the undergraduate course as a prerequisite. I already have experience with discussing Bhaskar on the Internet due to my membership in the bhaskar-mailing list, and I also hope to recruit other members of that list

to join us. Many members of the bhaskar list are University teachers, and my goal is to set up a joint email seminar for which students can get credit at several Universities. I sent out an email on May 25 inquiring whether there might be interest in such a project, and within a day I received 4 responses, from faculty at the Sociology Department of the University of Colorado at Boulder, the Economics Department of De Montfort University, and the School of Education, University of Cambridge, and the Western State University College of Law.

4.2 Copyright

I am working together with the U of U Technology Transfer Office to make all software previously written for the Econ 5080 class publicly available on my web page under the *GNU Public License (GPL)*, see www.gnu.org/copyleft/gpl.html. The software to be written under this proposal should therefore be protected by the same License.

4.3 Training

The software as it stands right now is a prototype and can only be used by someone who knows `emacs-lisp`. Furthermore it is tied very closely to my Annotations about Marx's Capital. With the modifications necessary to use it also for the graduate Seminar, I am taking the first step towards making it more widely accessible. Another step is the writing of a documentation for it. At the present time, no documentation exists other than comments in the code and the documentation strings of the functions. I will use part of the release time requested for this course to write at least a rudimentary documentation. For production versions, it would probably be advisable to re-code everything in Python, and turn it into a module of the GNU Mailman mailing list software. This

is not part of the present proposal, but the present proposal lays important groundwork for a later generalization of the software.

Another aspect of training is to enable graduate students to assist me in teaching the undergraduate course. So far I have not used graduate students, since I consider it very difficult to write the right answers to the student's contributions. In the present proposal I will retain the same graduate student for 2 Semesters. In part he or she will help me with technical issues, and in part I will try to train him or her to co-teach the undergraduate course with me. This will force me to systematize the thought processes I am going through when I write my responses to the students. This will be an interesting experiment. The results of this will then be discussed in the graduate Seminar, and I hope that participants of this Seminar will be able to help me teach future courses.

4.4 Resources and Services

All the students need is access to computers and, for their computers at home, access to the Internet through an ISP or the U of U call-in lines. The weekly 3-hour limit of connect time per person might be a problem; I will talk to ACLIS and see whether the students of my courses can get higher limits.

4.5 Development Schedule

A full completion of all the goals described above will not be possible in the project period. I will go as far as feasible, and will continue working on it afterwards, as I have done with this course in the past.

I plan to start working on the project right away.

Summer and Fall 1999: Preparation of the cooperative Graduate course so that there will be sufficient lead time to incorporate it in the schedules of the partner institutions. Conversion of the Archive of the Bhaskar list into L^AT_EX, so that it can be helpful for the discussion in this class. Reading up on object oriented programming in lisp.

Graduate student will get copyright permission for the reading materials, and scan all the assigned readings in, so that they are available on the www.

Spring 2000: I will take my first Semester of release time for writing the software for the AI component of the course and the voting about grades, in conjunction with a re-designed syllabus for the class. I will also extend the software so that it will be able to handle the graduate Seminar in the Spring 2001, and write a documentation for the software. Production of a CD-ROM which has the readings for both classes on it, the undergraduate 5080, and the graduate seminar. I will experiment with incorporating links into these documents, so that the reader can jump from one document to a relevant place in another document.

Fall 2000: The two undergraduate courses in the Fall 2000 are my regular teaching load. I will supervise the graduate student to be my co-teacher in the Undergraduate class. He or she will also assist students with computer problems.

Spring 2001: I will take my second Semester of release time so that the graduate Seminar will be the only course I teach.

4.6 Evaluation

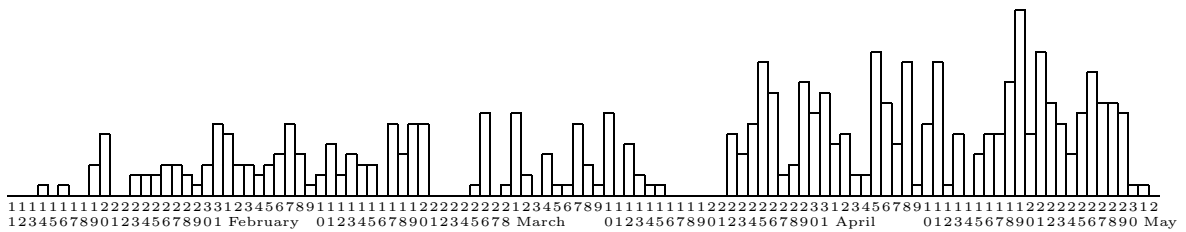
Evaluation can take many different forms:

- The quality of the internet discussion can be evaluated by analyzing the archives on the www.

- The evaluation of individual students by the instructor is facilitated by special printouts in which all contributions of the same participant are bundled together.

But the main emphasis of the evaluation of the HETI project should be whether the enhancements to the software meet the needs of the students.

- One main indicator of this will be the number of students that drop the class; in 1999, a quarter of the students initially enrolled dropped the class again. This is too much, and I hope that fewer students will drop the class after the present enhancements are in place.
- Another indicator of the success of the proposed changes is the time distribution of the number of submissions per day. Here is a graph of the lopsided density in the 1999 class, January – April 1999; each square □ represents one submission to the homework mailing list:



I hope that the corresponding graph in the Fall 2000 will be more evenly balanced.

- Another evaluation tool are the number of times students receive grade penalties for not following the rules. I will count this and want it to be an insignificant number.

5 Budget Justification

The budget provides two Semesters release time from teaching for me. One of these will be in the Spring 2000 so that I can write the software which gives automated responses to every participant

what their precise standing and their next deadlines are, and the voting procedure which allows the students to give feedback about the grades.

In the Fall 2000 I will teach both Sections of 5080 which will be my normal teaching load.

In the Spring 2001, I need release time for one course so that the graduate email seminar will be the only course I teach. The Department agrees to pay for the seminar itself as part of my normal teaching load.

The Graduate Student will be employed in the Spring and Fall 2000. In the Spring he or she has to do various technical things: try to get copyright permissions and scan in the material. I will also experiment with having cross-links between the different documents on the CD-ROM and on the internet. For instance the pdf file with this grant proposal has all the URL's embedded: all you have to do is click on them and you will be transported to the appropriate web page. He will also have to work through my Annotations because in the Fall he has to help me teach the students. I do not expect that I will save much time teaching the Graduate Student to answer the Student's submissions instead of doing it myself, but it will be interesting to see whether I can train someone who does a good enough job that I can be satisfied with it.

I need the scanner for putting all the readings for the seminar on the www and perhaps on CD-ROMs if we get copyright permission for this. The scanning must be done from the convenience of my office: instead of xeroxing the articles which I am reading for my own research and then stuffing them into filing cabinets I want to get into the habit of scanning them in and storing them on CD's. This benefits not only this course but also my other teaching and research; therefore the Department is funding 50% of the scanner.

I have a megabit connection right now from my home to the University. This is very convenient

and since it is inevitable that the www will play a greater and greater role, this allows me to stay up-to-date on what is happening on my web page, and to fix things if something is wrong.

6 Biographical Sketch

I have two Ph.D.'s, one in Mathematics and one in Economics. I have been at the Economics Department since 1985, present rank is Associate Professor. My main work since 1995 has been the writing of detailed Annotations to Marx's *Capital*. A selection of this [4] is used as study guide for Econ 5080. These Annotations uses Bhaskar's Critical Realism in order to make sense of Marx's Hegelianisms. Other work: "A Revised Geometry of Mean-Variance Efficiency" *Metroeconomica* 1993 [5]. "Relative Prices: Facts and Figures" together with Christian Bidard, unpublished, 1996 [3]. Various original work in Econometrics incorporated in his Class Notes on Econometrics, at www.econ.utah.edu/ehrbbar/ecmetrcs.pdf. I have also been participating in a Bhaskar mailing list in which another work of Bhaskar's, [1], was discussed collectively by a world wide team.

7 Appendices

7.1 Letters of Support

A letter from E. K. Hunt, the Chair of the Economics Department, is enclosed.

7.2 Copyright Letters of Understanding

Not Applicable.

References

- [1] Roy Bhaskar. *A Realist Theory of Science*. Harvester Wheatsheaf, New York, London, second edition, 1978.
- [2] Roy Bhaskar. *Dialectic: The Pulse of Freedom*. Verso, London, New York, 1993.
- [3] Christian Bidard and Hans G. Ehrbar. Relative prices: Facts and figures. Available on www.econ.utah.edu/ehrbar/rpff.pdf, 1996.
- [4] Hans G. Ehrbar. Annotations to Karl Marx's 'Das Kapital'. Available on www.econ.utah.edu/ehrbar/akmk.pdf.
- [5] Hans G. Ehrbar. A revised geometry of mean-variance efficient portfolios. *Metroeconomica*, 44(3):215–238, 1993. Available on www.econ.utah.edu/ehrbar/rgep.pdf.
- [6] Patrick R. Harrison. *Common Lisp & Artificial Intelligence*. Prentice Hall, 1990.