Ferris State University
College of Allied Health Sciences
Office of the Dean

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Memorandum

To: Annual Program Review Council

From: Jacqueline Hooper, Dr.P.H., Dean

Date: September 1, 2005

RE: Analysis of the Medical Laboratory Technology and Medical Technology Programs

Enrollment

Compared with enrollment seen in prior years, enrollment in clinical laboratory science (CLLS) programs nationwide, such as the AAS in Medical Laboratory Technology (MLT) and BS in Medical Technology (MT) at Ferris, began to decline markedly in the mid to late 1990's. As a result, CLLS programs were down-scaled or in some areas such as Colorado, the only BS program in the state was discontinued. However, within the last few years, colleges and universities have reported a modest but increasing gain in enrollment in MLT and/or MT programs.

When looking at the enrollment history of the CLLS programs at Ferris over the last ten years, a trend similar to that seen nationally can be seen. From 95F through 00F, enrollment in the MT program declined 50% from a high of 70 students to a low of 35 students. From 00F through 04F enrollment remained fairly flat with a high of 35 and low of 29 students.

Beginning in 05F, enrollment in both the MT and MLT programs is expected to begin to increase. As of August 27th, the projected enrollment count for 05F was 47 students, which if realized would be 18 students (62%) more than that seen in 04F. Although pending curriculum changes to MT and students enrolled in MT as a second major won't be reflected in the official 05F count when it becomes available, if these numbers were calculated in the count, enrollment is expected to be as high as 58 students.

Enrollment in the MT program is expected to continue to increase at a rate of about 10% per year into the foreseeable future as a result of high visibility of employment opportunities in health care, enrollment gains seen in the pre-MT program (70% increase was seen from 04F to 05F), continued recruitment initiatives directed at students who are not accepted into pharmacy or optometry, and the development of a MLT to MT on-line BS completion program.

Fall to Fall Enrollment from 1995-2005

	95F	96F	97F	98F	99F	00F	01F	02F	03F	04F	05F*
Pre-MT	10	6	4	4	2	4	4	8	6	3	10
MT	70	63	60	50	47	35	33	32	33	29	47
Subtotal	80	69	64	54	49	39	37	40	39	32	57
Pre-MLT	9	4	2	3	3	3	6	12	4	2	9
MLT	28	31	24	19	12	4	8	7	10	8	13
Subtotal	37	35	26	22	15	7	14	19	14	16	22
PHLEB										8	11
Total	117	104	90	76	64	46	51	59	53	50	90

*Enrollment as of August 27, 2005

Over the last ten years, the decrease in enrollment in the MLT program has been even more severe than that seen in the MT program with greater than a 90% decline realized from a peak enrollment of 31 students seen in 96F to an enrollment low of two students in 04F. From 95F through 98F, enrollment averaged 25.5 students before declining to an average of 8.2 students in 99F-03F.

Similar to the MT program, an enrollment increase will be realized in 05F. As of August 27th, the official projected enrollment count for MLT for 05F is 13 students, which constitutes an increase of five students (63%) over that seen in 04F. Again, although pending curriculum changes and students enrolled in MLT as a second major will not be reflected in the official 05F count, enrollment is expected to be around 20 students.

Beyond 05F, enrollment is expected to increase into the foreseeable future, but at a rate lower than projected for the MT program, as a result of the high visibility of employment opportunities in health care, enrollment gains seen in the pre-MLT program (a 350% increase was seen from 04F to 05F), continued recruitment initiatives directed at phlebotomy certificate students, and the development of an off-campus MLT program.

In the fall of 2004, a phlebotomy certificate was launched as means to funnel students into the MLT and subsequently the MT programs. The certificate program was developed to be offered both on- and off-campus. Initially, the program was offered on the Big Rapids campus. Through work with three Michigan Regional Skills Alliance groups, the program has been expanded to include offerings in Grand Rapids and Gaylord. As a result, it is anticipated that total enrollment in the certificate program this fall (05F) will be 27 students, which would constitute a 238% increase since the program was first offered in 04F. Because of the portability of the program, it is expected that it will be offered at additional locations across the state.

Composition and quality of faculty and staff

From 1992 through 2000, there were four tenure-track positions in CLLS and a full-time lab assistant. Due to faculty positions not being replaced subsequent to retirements, the number of tenure-track lines was decreased from four to three positions in 2000, and from three to two positions in 2002. The program has retained two tenure-track lines since 2002. In addition, the program has retained the full-time lab assistant. The faculty and lab assistant are all long-term employees of the university, master-degree prepared, and hold ASCP credentials which are required for the program to retain accreditation and program graduates to be eligible to sit for the professional credentialing exam.

Within the clinical lab science profession, there are four specialty areas: Body fluid analysis, blood bank, microbiology, and clinical chemistry. With the elimination of two tenure-track positions, the current faculty and the lab assistant largely have assumed teaching assignments in all four specialty areas as a result of assuming overload teaching assignments and hiring a small number of adjunct instructors. However, with the enrollment increase seen this fall in both the MT and MLT programs, and launch of the phlebotomy certificate at other off-site locations, reliance on adjunct instructors will steadily increase. Finding qualified adjunct instructors to teach in the on-campus and off-campus programs has been and will continue to pose a challenge. A request for a full-time temporary faculty will be submitted for AY 06-07 to provide instructional coverage to support expected increases in enrollment in all three programs (MT, MLT, phlebotomy) and to provide release time for tenure-track faculty to develop an off-campus MLT program and an on-line MLT to MT program.

Adequacy of facility, equipment and supply resources

During the 03W semester, the decision was made for the environmental health and safety and clinical lab sciences programs to exchange laboratory space so that the laboratory sections in the MT/MLT programs could be enlarged from eight or ten students to 16 students. During the summer of 2003, the CLLS labs were relocated to adjoining labs in the allied health building (VFS 421 and VFS 423) which allowed for greater seating space and room for equipment and supplies. With the enrollment growth realized this fall, both lab spaces are utilized between 8 am and 7:50pm four days per week. A minor cap request has been submitted for AY 05-06 to complete minor cosmetic upgrades to improve the appearance of the lab.

The CLLS programs are very equipment and supply intensive. The on-campus lab is equipped with state-of-the-art equipment including a Laboratory Information System (LIS). Much of the equipment has been donated to the program. Maintaining the equipment is a challenge because it is received after warranties have expired. Funds for repair are made available on an as needed basis from the Dean's Office budget. Maintenance of the LIS system has been a challenge. The system was purchased through Perkins Grant funding. At the time of purchase, budget had not been identified to support the purchase of an annual maintenance agreement. With the growth of the phlebotomy program, and development of off-campus/on-line programs, it is expected that receipt of incentive funds from UCEL and FSU-GR will be able to support the

purchase of an annual maintenance agreement. With future on-campus enrollment growth, because the lab is already scheduled throughout the day and evening Monday through Thursday, more equipment and supplies will need to be obtained in order to accommodate sections greater than the current capacity of 16 students.

Because the MLT also is a laboratory intensive program, expansion of the program off-campus will require collaborating with a hospital for access to their lab for teaching purposes or purchasing equipment to outfit a lab at a partner community college. Discussions with community colleges and hospitals in northern Michigan will ensue this fall to determine a means in which laboratory instruction can be delivered so that a MLT program can be launched as early as 06F.

As mentioned previously, further expansion of the CLLS program to include development of an online MLT to MT completion program will require a third full-time faculty position in order to provide release time to tenure-track faculty for course development. In addition, approval from the Higher Learning Commission, greater availability of instructional design staff, and better operational/technical support of the Web-CT platform will be needed if the decision to offer the program 100% on-line is made.

The program has enjoyed a long-term relationship with Mecosta County Medical Center whereby the full-time laboratory assistant picks up specimens donated daily for use in the lab. This relationship is expected to continue. However, for supplies that are purchased, although the full-time lab assistant continues to identify the most economical sources available, the cost of supplies in general has increased dramatically. As a result, a greater proportion of the supply and expense budget allocated to the College has been shifted to the CLLS program. Because the College receives a percentage of the incentive funds from UCEL and FSU-GR for growth realized in off-campus programs, it is anticipated that further increases in supply costs can be accommodated.

Quality of curriculum and instruction

The quality of curriculum and instruction in the CLLS programs is excellent as demonstrated by maintenance of accreditation, high first-time pass rates on the American Society of Clinical Pathologists (ASCP) credentialing exam, high employment placement rates, and high graduate and employer satisfaction.

Currently, the MT and MLT programs are accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). A request for recognition of approval for the phlebotomy certificate will be submitted to NAACLS in the fall. The MT and MLT programs are scheduled for a re-accreditation site visit in AY 06-07.

Because the MT and MLT programs are NAACLS accredited, graduates can sit for ASCP certification. Since the last APR, the professional credentialing exam pass rates for the MT program have averaged 74.67%. As noted by faculty, the pass-rate in 2001 was disappointing. Following the poor pass-rate performance, the faculty revised the curriculum in the capstone lab course. Subsequent to the curricular revision, the pass rates in the MT program improved in 2002-2004 with rates exceeding the national average in 2003 and 2004.

% Students Passing the ASCP Credentialing Exam on the First Attempt

	1999	2000	2001	2002	2003	2004
MT	72%	81%	56%	73%	85%	81%
MLT	100%	67%	100%	67%	100%	100%

Although the number of MLT students per who took the ASCP exam each year was small, the average first-time pass rate was 89% from 1999-2004, with 100% of the students passing in four of the six years. In addition, the program pass rates exceeded the national average in each year that a pass rate of 100% was obtained.

Employability of graduates has also been excellent with 100% securing employment within one year of receiving their degree.

% Students Securing Employment w/in One Year After Graduation

	1999	2000	2001	2002	2003	2004
MT	100%	100%	100%	100%	100%	100%
MLT	100%	100%	100%	100%	100%	100%

On average, student and employer satisfaction with the program has been equally as good. Comments received from students and employers have been considered when curriculum revisions occurred. Comments from employers indicate that as a result the hands-on emphasis of instruction, particularly within the capstone lab course, Ferris graduates are better prepared to assume entry-level employment than graduates of other programs.

In order to maintain curricular currency and remain in compliance with accreditation standards, the MT/MLT curriculum is revised every three to five years. Over the years, the curriculum has been modified to include the use of a variety of pedagogic approaches including web enhancement, problem based learning, and a focus on critical thinking. Recently, lecture and lab instruction that has been delivered in one course was separated into two courses. In addition, as mentioned previously, a phlebotomy certificate was created in which all 12 credit hours earned seamlessly apply toward completion of the MLT and MT degrees. This coming year, the curriculum will be revised to reduce the hours to graduation in the MT program from 139-140 to 128. Lastly, plans call for conversion of didactic courses to an on-line format beginning in AY 05-06 so that the MLT program can be offered off-campus.

Student characteristics

The MT and MLT programs attract students who are interested in health care but prefer to pursue employment with a limited degree of patient interaction. Of on-campus students, the majority attends classes full-time, is from Michigan, and is predominantly Caucasian females. Students in the on-campus program are recruited from chemistry courses and from the pool of students not admitted into the pharmacy or optometry programs. From 2000-2003, the average ACT score of students who graduated from the MT program was 23.9 which was above the average seen for the university. The average ACT for MLT graduates from 2000-2004 was 21.9. Over the years, the on-campus MT/MLT programs have attracted a larger proportion of non-traditional students. Students in the phlebotomy certificate are primarily working adults who are seeking an opportunity to quickly obtain employment in a healthcare setting.

Program value

As seen by a sustained employment placement rate of 100%, graduates of the MT and MLT programs are filling new or replacement positions in a variety of clinical laboratory employment settings including in hospitals, industry, education, research, and law enforcement. Survey feedback from employers indicates that they preferentially hire Ferris graduates because they can perform the roles and responsibilities of entry-level practitioners immediately upon being hired after graduation. The CLLS program is one of two in the state that provides career-ladder opportunities that allows students to seamlessly progress from a certificate through associate and bachelor degrees. Continued development of off-campus phlebotomy certificate programs provides access to place bound students who could not otherwise access such educational opportunities. Addition of an off-campus MLT and on-line MLT to MT programs will further increase student access and will provide a ready source of graduates to address the large number of retirements expected to occur as a result of an aging clinical lab workforce.

Program visibility and distinctiveness

The MLT and MT programs were started in the 1967 and 1972 respectively. The programs were among the first in the nation to convert from a hospital to a university-based format that culminates with a simulated laboratory learning experience. In the simulated lab, students assume the various roles and responsibilities that they might experience in a clinical lab setting thereby preparing them to immediately assume an entry-level position in a variety of clinical lab settings. The simulated laboratory capstone experience has set the Ferris program apart from its competitors for years. However, recently GVSU revised its MT program to include a simulated lab component. Lastly, Ferris is the only university in the upper northern peninsula to offer the MT and MLT programs.

Development of the off-campus phlebotomy program has further increased the visibility of the program across the state of Michigan. Creation of the phlebotomy program has provided a diverse population of individuals including high school students, un- or underemployed adults, and community college transfers with the opportunity to quickly obtain employment in a health care setting. Partnerships with MichiganWorks! Agencies, hospitals, community colleges, and public schools through Michigan Regional Skills Alliances has resulted in collaborative program promotion and student recruitment initiatives.

The two faculty members in the program are well known among CLLS professionals in the state and nation. Both faculty members are active in their professional association and continue to pursue professional development opportunities. Additionally, the faculty and students in the program have received recognition at the state-wide level. Dan deRegnier received the Michigan Society of Clinical Lab Sciences (MSCLS) Mentorship Award and Barbara Ross was the recipient of the Outstanding Graduate Award upon completion of her master's degree at University of Medicine and Dentistry of New Jersey. Additionally, students have received individual and team awards at several of the Michigan Society of Clinical Lab Sciences (MSCLS) competitions.

Centrality of the program to the University mission

The MT and MLT programs both advance the mission of the University. Both programs are career oriented, technically based, and prepare graduates through a combination of general education and professional coursework for employment in a variety of clinical lab science settings in the State of Michigan and throughout the United States.

APRC Questions for CLS PRP

I. Program Overview

1. Where are the internship sites for the students in the MLT & MT programs?

Affiliate	*Number of spots*	
	MT	*MLT*
Alpena General Hospital Alpena, MI	*1*	
Bay Medical Center Bay City	*3 MT or MLT; any combination*	
Bronson Methodist Kalamazoo	*1*	*1*
Central Michigan Community Hospital Mt. Pleasant	*1*	
Covenant Health Saginaw	*1*	
Gerber Memorial Hospital Fremont		*1*
Gratiot Community Hospital Alma	*1*	*1*
Henry Ford Hospital Wyandotte	*1*	
Holland Hospital Holland	*1*	
Mecosta County General Big Rapids, MI	*1*	
Mercy Hospital Muskegon	*2 MT or MLT, any combination*	
Metropolitan Hospital Grand Rapids	*2*	
North Ottawa Community Health System, Grand Haven	*1*	
St. Mary's Grand Rapids		*1*
Standish Community Hospital Standish		*1*
U of Michigan Ann Arbor	*2 (up to 6)*	
United Memorial Hospital Greenville		*1*
Charlevoix Area Hospital Charlevoix		*1*

APRC Questions for CLS PRP

II. Collection of Perceptions

1. The student survey indicates some dissatisfaction with regard to (General Education) support courses. The employer survey indicates satisfaction with (e.g.) graduate communication skills. How do you reconcile these conflicting perceptions?

It is difficult for a student to see the importance of courses other than those in the program. This is mainly due to inexperience. The employers, on the other hand, have years of experience and see the value in courses, including those that teach communication skills. We are confident that as the students gain experience on internship that they will begin to see the value in those courses, as well.

2. A frequently made comment refers to the stress of hospital lab work (and lab politics). Does the program incorporate units into course to help students anticipate and deal with this stress?

During CLLS456 Clinical Laboratory Practicum (Simulated laboratory) we often increase the student workload as the semester progresses. In this way we can observe how the student deals with more tasks to accomplish, but in the same amount of time. In addition, we make frequent telephone calls to the lab. In these calls, we simulate the roles of nurses, physicians and others who demand test results or ask questions about specimens, timing, and other pre-analytic issues. This forces the students to interrupt their current task, answer the question, compose a response, and then return to their original task. Many of the analyzers are temperamental and the students are forced to troubleshoot the problem before they can finish their workload. They may even be required to phone the instrument manufacturer for help with the troubleshooting.

III. Program Profile

1. Discuss the programs' efforts and goals to recruit and retain minority students.

The program does not make any special effort to recruit and retain minority students, other than our previously stated efforts. The minority students seem to find us. We have not discovered how and/or why.

The enrollment, CLS Fall 2005, reflects a very diverse population of students:

Students Enrolled in CLLS course with a 200 or 300 Prefix, Fall 2005, Race/Ethnic Origin (%)		*University, 2004, Race/Ethnic Origin*
Native American/Alaskan Native	*3.6%*	*1%*
Asian or Pacific Islander	*7.1%*	*2%*
Black	*14.3%*	*6%*

The government of Botswana has sent 6 students to students to study clinical laboratory sciences at Ferris State University. We believe they will continue send students to us because of the positive experiences of graduates.

APRC Questions for CLS PRP

Discuss the programs' use of adjuncts.

Course	Semester
CLLS230(231) Hematology	*Fall*
CLLS230(232) Hematology Lab	*Fall*
CLLS121(122) Introduction to Specimen Collection	*Fall, Winter, Summer*
CLLS121(123) Specimen Collection Laboratory	*Fall, Winter, Summer*
CLLS224(218) Body Fluid Analysis	*Summer*
CLLS456 Clinical Laboratory Practicum	*Fall*
CLLS430(431) Advanced Hematology	*Winter*
CLLS430(432) Advanced Hematology Laboratory	*Winter*

Since the retirement of John Landis we have several different instructors for the Hematology courses. We feel that this has led to inconsistency in the way the content is taught, especially when the instructor for the lecture is different then for the laboratory. CLLS456 Clinical Laboratory Practicum (Simulated Laboratory) is one of the courses that makes our program unique. This year the tenured faculty will not be leading that course.

2. Explain how students ladder from the MLT to the MT program. The checksheets seem to indicate that some extra courses might be required in order to ladder.

FERRIS STATE UNIVERISTY
MEDICAL TECHNOLOGY PROGRAM
SUGGESTED COURSE SEQUENCE

Fall	**Year**	**One**		**Winter**	**Year**	**One**
BIOL	103	4		BIOL	108	4
CHEM	114	4		CHEM	214	4
CLLS	101	1		CCHS	101	3
FSUS	100	1		CLLS	122	2
MATH	117	4		CLLS	123	1
MRIS	102	1		ENGL	150	1
				Elective		3
		15				17
Fall	**Year**	**Two**		**Winter**	**Year**	**Two**
BIOL	205	5		BIOL	300	3
CHEM	324	3		CLLS	241	2
COMM	221	3		CLLS	242	1
EHSM	315	3		CCHS	102	1
ENGL	250	3		CCHS	103	1
				Elective		3
				Elective		3
		17				14

APRC Questions for CLS PRP

		Summer	Year	Two		
		CLLS	216	3		
		CLLS	217	1		
		CLLS	218	1		
		CLLS	219	1		
		CLLS	220	1		
		CLLS	252	2		
		CLLS	253	1		
				10		
Fall	**Year**	**Three**		**Winter**	**Year**	**Three**
CLLS	231	2		CLLS	431	2
CLLS	232	1		CLLS	432	1
CLLS	236	2		CLLS	436	2
CLLS	237	2		CLLS	437	2
CLLS	258	2		CLLS	458	1
CLLS	259	1		CLLS	459	1
CLLS	356	2		Elective		3
CLLS	357	1		Elective		3
ENGL	321	3				
		16				15
Fall	**Year**	**Four**		**Winter**	**Year**	**Four**
CLLS	456	3		CLLS	481	1
CLLS	465	3		CLLS	491	14
CLLS	499	1		CLLS	494	1
HCSA	335	4				
Elective		3				
		14				16

APRC Questions for CLS PRP

FERRIS STATE UNIVERSITY
MEDICAL LABORATORY TECHNOLOGY PROGRAM
SUGGESTED COURSE SEQUENCE

Fall	Year	One		Winter	Year	One
BIOL	108	3		BIOL	205	5
CHEM	114	4		CHEM	214	4
CCHS	102	1		CLLS	122	2
CLLS	101	1		CLLS	123	1
MATH	117	4		ENGL	150	3
MRIS	102	1		COMM	221	3
FSUS	100	1				
		15				18
		Summer	**Year**	**One**		
		CLLS	216	3		
		CLLS	217	1		
		CLLS	218	1		
		CLLS	219	1		
		CLLS	220	1		
		CLLS	252	2		
		CLLS	253	1		
		CCHS	103	1		
		Elective		3		
				14		
Fall	**Year**	**Two**		**Winter**	**Year**	**Two**
CLLS	231	2		CLLS	241	2
CLLS	232	1		CLLS	242	1
CLLS	236	2		CLLS	256	3
CLLS	237	2		CLLS	281	1
CLLS	258	2		CLLS	292	6
CLLS	259	1		CCHS	101	3
ENGL	250	3				
Elective		3				
		16				16
		Summer	**Year**	**Two**		
		CLLS	293	5		

FERRIS STATE UNIVERSITY
MEDICAL TECHNOLOGY COMPLETION PROGRAM FOR CERTIFIED MLTS
SUGGESTED COURSE SEQUENCE

Fall	Year	Three		Winter	Year	Four
BIOL	103	4		CLLS	431	2
CHEM	324	3		CLLS	432	1
CLLS	356	2		CLLS	436	2
CLLS	357	1		CLLS	437	2
EHSM	315	3		CLLS	458	1
				CLLS	459	1
				Elective		3
		13				12
Fall	Year	Four		Winter	Year	Four
CLLS	465	3		CLLS	494	1
CLLS	499	1		Elective		3
HCSA	335	4		Elective		3
Elective		3		ENGL	321	3
Elective		3		BIOL	300	3
		14				13

When nationally – certified medical laboratory technicians come to Ferris State University to complete the requirements for the BS degree, it takes two years or less to finish. These students are invariably employed in a clinical laboratory, so the program does not require them to take CLLS 456: Clinical Laboratory Practicum. The rationale for this is that employment in an actual clinical laboratory is better experience than we can simulate on campus. In addition, we waive CLLS 491, since their employment usually involves increasing responsibilities as they gain experience on the job and additional knowledge from their course work. A second internship is not needed.

We require the "laddering" students to complete CLLS 494, which is a self –directed management project that can be based at their employment site. Combined with the 300 and 400 level CLLS courses, these students gain some insight into and experience with, the levels of knowledge and skills that are required of laboratory professionals who have earned a baccalaureate degree.

IV. Facilities and Equipment

1. Discuss the status of the programs' efforts to obtain maintenance agreements for their equipment.

Routine maintenance agreements on laboratory equipment is very costly and beyond our budget. In the past we have established a rotating schedule of preventative maintenance service calls. For example, Instrument X will be serviced in 2005, 2007, 2009, etc, while instrument Y will be serviced in 2006 and 2008. This has worked in the past; however, if Instrument X needs service in 2006 it may not receive that service. Additionally, as budgets have been reduced, maintenance agreements are often the first to be cut.

When the program receives a piece of equipment of donated equipment the maintenance agreement may be transferred to us. This is the exception, rather than the rule, however.

It may even more important now that there is only one instrument repair technician on campus who can handle any minor repairs to the instruments.

2. Comment on the programs' experience in using WebCT for instructional delivery.

Many of the CLLS courses are enhanced with WebCT. For example, we deliver course notes via WebCT. It also serves as a secure place to post grades. For the past two years, CLLS241 has been taught on-line and the lab has met on Saturdays. This year, CLLS231 is also being taught on-line (by an adjunct), while the lab is being taught face-to-face (by a different adjunct).

We believe Ferris State University was the first university-based program in the state to use an on-line course package for the clinical experience. It has been a great advantage to us and our affiliates. It frees up time from grading exams, mailing documents, saved money on copy costs and postage.

V. Conclusions

1. Discuss in more detail the kind of enhancement you think the programs' enrollment would support and which would help them.

The enhancements we are looking, due to our increasing enrollment, include:

Full-time faculty to replace content expertise lost in the past few years.

Offering the MLT program in off-campus sites around the state.

Increase the numbers of sites where the Phlebotomy certificate is offered.

Purchase additional equipment (and maintenance agreements).

Clinical Laboratory Sciences Program
College of Allied Health Sciences
Ferris State University

Program Review Report

Program Review Panel:

Dr. Peter Balanda
Mr. Daniel P deRegnier (Chair)
Ms. Ellen Haneline
Ms. Cynthia Konrad
Ms. Barbara Ross

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Section One: Overview of the Program

Section 1: Overview

A. Program Goals

1. The goals of the CLS programs Medical Technology (MT), Medical Laboratory Technology (MLT) and Phlebotomy certificate

a. To prepare graduates for employment in a variety of settings at career entry level.
b. To define clearly what is expected of students at all levels of the program, to make these expectations clear to all students, and to help students fulfill those expectations.
c. To incorporate appropriate liberal arts, science, and Allied Health core courses into the curriculum and to educate professionals aware of the needs and values of a changing world.
d. To provide evaluation mechanisms which recognize individual competencies and allow for advanced placement where appropriate.
e. To provide the opportunity for worthwhile clinical experiences for all qualified students.
f. To offer appropriate continuing education opportunities to medical laboratory professionals.

2. These goals were developed by the faculty of the CLS program and approved by the CLS advisory committee about 15 years ago. They have been reviewed during subsequent advisory committee meetings and have allowed to stand as written.

3. The goals reflect program graduate needs for technical, professional and general education. Graduates function in a wide variety of employment settings.

4. The goals have not changed since the last APR. We feel they still accurately reflect our programs. The CLS Advisory Committee reviews the program goals on a regular basis and has not recommended changes.

5. The Clinical Laboratory Sciences programs fit well into the overall mission of Ferris State University and the College of Allied Health Sciences

Mission of Ferris State University: Ferris State University will be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological and professional education.

Mission of CAHS: The College of Allied Health Sciences will be a national leader in quality education preparation for health-related careers.

Excerpts from the vision of the CAHS: "...The preparation of our students will increasingly merge technical content with computer, communication, critical thinking, and collaborative skills. Our graduates will be nationally known and recruited for the excellence of their preparation... the programs will be known and respected throughout the country for the teaching/learning approaches utilized, the caliber of the graduates, and the strength of the faculty... there will be a close collaboration with health care providers, industry and government to assure curriculum relevance and maximum utilization of resources."

Mission of the CLS programs: The mission of the Clinical Laboratory Sciences programs at Ferris State University is to prepare graduates who are ready for career entry level employment in a variety of clinical laboratory settings: hospitals, blood banks, independent and physicians' office laboratories, clinics,

health maintenance organizations, urgent care centers, and industry. All graduates should be:

- Able to follow all safety policies of the workplace, and recognize and correct unsafe practices
- Ready to work as a member of the health care team
- Capable of professional advancement
- Able to maintain technical competence under the normally stressful conditions of the clinical laboratory
- Able to integrate theory and practice effectively
- Able to generate data to be used in patient care, evaluate the validity of data, and to assure reliability before reporting test results
- Able to recognize the importance of quality control and quality assurance programs
- Able to collect and process samples of blood and other body fluids, and evaluate the suitability of these samples for analysis
- Able to perform routine tests and appropriate additional follow-up tests where needed
- Able to maintain instrumentation and identify and correct malfunctioning systems
- Able to communicate effectively with coworkers, patients, their families, and others
- Able to perform professionally by respecting the confidentiality of laboratory data; maintaining neatness in personal habits, work areas, and laboratory reports; performing to the best of their abilities; following established employment policies; and assuming responsibility for their conduct and their work.

In addition, baccalaureate graduates should:

- Be capable of professional advancement and study, in laboratory and health care management and education positions
- Understand, promote, and participate in total quality management and continuous quality improvement programs
- Manage and supervise other laboratory professionals, providing clinical instruction and continuing education where appropriate
- Develop and implement new methodologies and tests systems as the need arises;
- Be aware of, comply with, and monitor external regulatory requirements…
- Correlate results for all areas of the laboratory and relate these results to the clinical condition of the patient.

B. Program Visibility and Distinctiveness

1. The CLS programs at Ferris State University are unique in a variety of ways:
   a. On – Campus simulated laboratory where students "practice" working in a lab for before their internship.

   b. Well-equipped labs. Students are able to learn to operate a variety of equipment that is identical to that found in the clinical setting. This provides them with the opportunity to gain proficiency on-campus prior to their assignment to the clinical setting.

   c. Internship is guaranteed. Unlike some other programs in the state, we make sure the eligible student has a site for internship. Students do not have the responsibility of locating their own internship sites.

d. Experienced faculty. The tenured faculty members have a total of 45 years of experience teaching CLS students. The adjunct faculty also has many years of current laboratory experience.

e. Functioning Laboratory Information System (LIS). An LIS is a large database to manage patient test orders, specimens, and laboratory results. All clinical laboratories use these systems and Ferris is one of the few university- based programs where students can practice using an LIS before their clinical experience.

2. We attract quality students by:
    a. Recruiting heavily in high schools and in career technical schools. We also attract Ferris pre-pharmacy and pre-optometry students who are not accepted into their respective programs.
    b. Taking full advantage of the CAHS recruiter, who has been essential in helping us get the word out to students who are undecided as to which health care career they want.
    c. Using programmatic marketing funds to create a poster with a "reply for more information" card
    d. Offering 5 $1000.00 scholarships to new students
    e. Offering 5 $100 coupon toward the purchase of textbooks for each of the next three years
    f. Attending the Health Occupation student association and the Michigan science teacher association meetings to make both students and their teachers aware of the career opportunities in the Clinical Laboratory Sciences
    g. Creating a career ladder (phlebotomy to MLT to MT) that meets the needs of a diverse population of students.
    h. Offering the phlebotomy program off-campus to create a potential pool of graduates to funnel into the MLT and MT programs.

3. The institutions that offer the main competition to our MT:
    a. Grand Valley State University (GVSU)
    b. Michigan State University (MSU)
    c. Andrews University
    d. Northern Michigan University (NMU)
    e. Eastern Michigan University (EMU)
    f. Wayne State University

The institutions that offer the main competition to our MLT program:
    a. Kellogg Community College
    b. Northern Michigan University
    c. Baker College of Owosso

The institutions that offer the main competition to our Phlebotomy program:
    a. Baker College of Owosso and Jackson
    b. MEDRIGHT, Professional Medical Education
    c. Northern Michigan University

a. Other than MSU, these are small programs that enroll a limited number of students per year. We have combined our MT and MLT students in the 100 and 200 level courses with a CLLS prefix. All of students enroll in CLLS122 and 123. This increases our efficiency. All programs in the state have had to deal with fluctuations in enrollment and have had to increase their recruiting efforts. FSU is the only program in the state that is working to move programs off-campus to meet statewide demand.

b. FSU works with Michigan Association of Laboratory Science Educators (MALSE) on issues of common concern. For example, development of a recruiting CD ROM and "Lab in a Box" to be used for student recruitment. We work cooperatively with some of the other programs in the state. We have investigated the possibility of shared course offerings.

C. Program Relevance

1. Labor Market Analysis

Recently, Laboratory Medicine conducted surveys of laboratory personnel vacancy and pay rates. In the Laboratory Medicine (March 2005) survey of medical laboratory managers (table 1), the vacancy rate was computed by dividing the mean number of vacant positions by the mean for budgeted numbers of full-time equivalent employees. The results are summarized in the table below.

Table 1: Average Vacancy Rates for Laboratory Personnel by Region, 2003

	Region					
% FTE Vacancy Rate	Northeast	**East North Central (including Michigan)**	South Central Atlantic	West South Central	West North Central	Far West
MT (staff)	3.6	**2.9**	5.6	4.6	2.9	5.9
MT (supervisor)	3.5	**2.7**	4.4	1.2	4.1	3.4
MT (manager)	3.6	**2.0**	15.0	1.3	2.5	1.5
MLT (staff)	4.3	**4.4**	4.6	7.6	7.4	9.3
Phlebotomy (staff)	7.4	**4.5**	9.3	7.8	14.8	3.8

Reference: Steward, Colette K. Ward-Cook and S. Tannar, 2003 Wage and Vacancy Survey of Medical Laboratories. *Laboratory Medicine*. March 2005; 36(3): 149 - 157.

Table 2: Vacancy Rate Percentages from 1996 - 2003

Position	1996	1998	2003	% change
Medical technologist: staff	8.2	10.2	4.3	(57)
Medical technologist: supervisor	8.6	9.3	3.3	(65)
Medical technologist: manager	7.7	15.4	1.9	(88)
Medical laboratory technician	9.4	11.1	8.6	(33)
Phlebotomy Technicians	N/AV	N/AV	6.6	N/AV

Reference: Steward, Colette K. Ward-Cook and S. Tannar, 2003 Wage and Vacancy Survey of Medical Laboratories. *Laboratory Medicine*. March 2005; 36(3): 149 – 157

Although the vacancy rates have decreases since our last APR, it has been shown by these same surveys that the pay rates continue to climb. The following table is a comparison between the survey completed in March, 1999 (our last APR), and the current survey. It shows the average median hourly pay rates for a variety of lab workers and is broken down by region. Michigan is in the East North Central region.

These data reflect numbers needed to replace existing laboratory staff. Recent professional meetings and publications indicate that new test methods and systems, such as automated molecular diagnostics analyzers, will increase the

number of tests and greatly increase the test volumes of clinical laboratories. These new developments, as well as tests developed as a result of the Human Genome Project, will increase the demand for trained laboratory personnel. ASCP has stated that it is anticipated that there will be about 9000 laboratory jobs per year for the rest of this decade, with about 4000 graduates per year. An MSU study focusing on MI only indicates that there will be approximately the same need in Michigan: there will be about 2 jobs per year available for each MI graduate (K. Doig, personal communication). Finally, According to the Bureau of Labor Statistics, between 2002 and 2012, the need for Medical and Clinical Laboratory Scientists will increase by 19% from 149,952 to 178,879, due in part to the graying of the current workforce.

Table 3: Hourly Median Pay Rates for Beginning Level Laboratory Personnel by Region, 2003

	Region					
Average Hourly Rate	Northeast	**East North Central**	South Central Atlantic	West South Central	West North Central	Far West
MT (staff)	20.04	**20.00**	19.13	18.55	19.44	23.00
MT (supervisor)	25.36	**24.54**	23.00	22.90	24.00	27.96
MT (manager)	31.23	**29.81**	29.00	28.50	28.00	35.00
MLT (staff)	17.75	**16.73**	15.13	14.70	15.66	16.48
Phlebotomy (staff)	12.36	**11.30**	10.33	9.50	10.75	12.75

Reference: Steward, Colette K. Ward-Cook and S. Tannar, 2003 Wage and Vacancy Survey of Medical Laboratories. *Laboratory Medicine*. March 2005; 36(3): 149 – 157

The Ferris Career Planning and Placement Services provides a summary of placement and salaries gathered from graduates during the first five months after graduation. The tables below summarize the results of surveys collected following the 1999-2003 academic years for both the MT and MLT programs. There are no data for the Phlebotomy certificate, because the first graduate completed the program in 2005.

Medical Technology, BS

Year	# of Grads	% Response	# of Responses	% Placement Rate	# of Job/#CE	# CE only	Average Salary
99-00	20	50	10	100	10	1	N/AV
00-01	10	40	4	100	4	N/AV	34,217
01-02	12	42	5	100	5	N/AV	33,288
02-03	5	40	2	100	2	0	N/AV
03-04	16			100	1	1	

Medical Laboratory Technician, AAS

Year	# of Grads	% Response	# of Responses	% Placement Rate	# of Job/#CE	# CE only	Average Salary
99-00	10	90	9	100	9	4	
00-01	6	83	5	100	5	N/AV	22,336
01-02	4	25	1	0	0	N/AV	N/AV
02-03	1	0	0	0	0	1	N/AV
03-04	4			100			

This data indicate that Ferris MT and MLT students are in high demand. In addition, it shows that our graduates have a commitment to continuing their education.

According to *Occupational Outlook Quarterly*, Bureau of Labor and Statistics:

Job Outlook for Clinical Laboratory Technologists (MT) and Clinical Laboratory Technicians (MLT)

Job opportunities are expected to be excellent, because the number of job openings is expected to continue to exceed the number of job seekers. Employment of clinical laboratory workers is expected to grow about as fast as the average for all occupations through the year 2012, as the volume of laboratory tests increases with both population growth and the development of new types of tests.

Technological advances will continue to have two opposing effects on employment through 2012. On the one hand, new, increasingly powerful diagnostic tests will encourage additional testing and spur employment. On the other hand, research and development efforts targeted at simplifying routine testing procedures may enhance the ability of nonlaboratory personnel—physicians and patients in particular—to perform tests now conducted in laboratories. Although hospitals are expected to continue to be the major employer of clinical laboratory workers, employment is expected to grow faster in medical and diagnostic laboratories, offices of physicians, and other ambulatory health care services, including blood and organ banks.

Although significant, job growth will not be the only source of opportunities. As in most occupations, many openings will result from the need to replace workers who transfer to other occupations, retire, or stop working for some other reason.

Median annual earnings of medical and clinical laboratory technicians were $29,040 in 2002. The middle 50 percent earned between $23,310 and $35,840. The lowest 10 percent earned less than $19,070, and the highest 10 percent earned more than $43,960.

Conclusions

According to recent surveys, there are jobs available. Certain regions of the United States have more vacancies than other regions. Results from the FSU Planning and Placement Services show high placement rates for our graduates.

The adjunct advisory committee and health occupation specialists predict more jobs due to the "graying of the workforce."

Anecdotally, the faculty receive several phone calls each month from hospitals and other labs with job openings and inquires about recent graduates.

2. The program responds to emerging issues in the discipline, changes in the labor force, changes in employer and student needs by continually upgrading equipment, revising the curriculum every 5 years or so. During curriculum revision we use advisory committee input and communication with lab instructors to change course content to reflect current practice. For example, the program addressed the need for trained phlebotomists by starting a Phlebotomy Certificate in Big Rapids and satellite locations. Faculty are active in profession organizations, for example Clinical Laboratory Management Association (CLMA) and American Society for Microbiology (ASM), and the American Society for Clinical Laboratory Sciences (ASCLS). By attending their meetings, the faculty is able to stay abreast of changes in the discipline.
Laboratory managers continue to cite FSU's program as best preparation for those interested in lab medicine careers. They routinely direct potential students to our program. Students continue to succeed during internship and are hired by our clinical affiliates. Lab managers (e.g. North Ottawa, Standish Community Hospital, Charlevoix, Henry Ford – Wyandotte) call the program and ask for student interns because they recognize the quality of the program. After many years of trying to increase our MLT enrollment without much success, we are now investigating MLT at other sites. It is too early to comment on the effectiveness.

The question asks for an assessment of the effectiveness of the program's response.

3. According to an informal survey conducted in CLLS101 Orientation to Clinical Laboratory Sciences, the students listed the following as reasons for enrolling in our CLS program:

- Small class size
- Reputation of the program and faculty
- On-Campus simulated lab
- Hands on experience
- Guaranteed internship site for eligible students
- Lab managers encourage prospective CLS student to attend program because of our excellent reputation

This question is not asked on our graduate survey.

a. We believe that we exceed the expectation of the students. We are continually updating our instrumentation, revising curriculum to reflect the changing technologies, and participating in continuing education opportunities. For more information, refer to the graduate survey results.

b. Every student meets with a faculty advisory at least once per semester, each faculty is evaluated twice per semester by students in the program using the Student Assessment of Instruction (SAI), and occasional in-class surveys.

D. Program Value

1. The clinical laboratory sciences programs benefit the university by offering a program that is unique in Western Michigan. The Medical Technology program is the only program in the northern lower peninsula and provides an opportunity for students in the northern part of the Lower Peninsula to enroll in a program near their home. A

state of the art laboratory and experienced faculty enhance the reputation of the program and serve as an incentive for students to enroll.

2. The students learn in state-of-the-art equipped labs that are not available to students in similar programs. Our on-campus simulated laboratory (for the MT and MLT program) provides cost-effective preparation for clinical laboratory students. The courses are taught by faculty and staff, who are dedicated to the profession of laboratory medicine and Ferris. We also benefit the university by providing an alternative for students in pre-pharmacy, pre-optometry and other competitive programs that have more applicants that places available. The students who are enrolled in MT and MLT programs benefit because they are given many hours in the laboratory using state-of-the-art equipment. The final semester on campus includes simulated laboratory, the unusual aspect of Ferris's program, which enables students to be prepared to practice their profession with a much-shortened internship experience and then graduate. The students arrive ready to perform well at their assigned affiliates, having had considerable practice in routine and problem-solving laboratory situations on campus.

3. Our program prepares a large number of the annual CLS graduates in Michigan. Program graduates have been hired statewide, from the U.P., and from Alpena to Petoskey and from Monroe to St. Joseph. Other graduates have moved to nearly every state in the nation. Besides serving traditional clinical laboratories, program graduates are employed in industry, laboratory management, research and related fields. It seems that demand for graduates is increasing while enrollment in many programs across the country is just now leveling off and even increasing. The employers who hire our graduates are very pleased with the level of their entry-level skills and their attitude toward the profession. All of the employers would hire a Ferris graduate again. These opinions are expressed on surveys and directly to faculty during visits to the lab and discussion at professional meetings.

4. The faculty participates in local, statewide, national, and international continuing education activities. In addition to attending programs, all have presented continuing education in a wide variety of formats. Some who of the faculty have written and reviewed chapters or sections of textbooks. We who have also served as site surveyors for CLS programs undergoing re-accreditation, served on planning committees for national meetings. Four past faculty members have served as president of the Michigan Society of Clinical Laboratory Sciences and been selected as Michigan Clinical Scientists of the Year.

5 The faculty and students have, when at one time or another, provided services to groups outside the university. Several current and former students have been involved with the American Red Cross blood collection drives. Graduates of the program have represented Ferris and CLS at recruiting fairs. The registered student organization, Association of Clinical Laboratory Science (ACLS) performs several service projects each semester, such as Project Starburst, Toys for Tots collection, and Salvation Army bell ringing. For example, faculty has provided blood borne pathogen training for Sunday school teachers and in-service training for Metropolitan Hospital lab employees.

Section 2: Collection of Perceptions

Section 2: Collection of Perceptions

A. Graduate Follow-up Survey

A total of 26 surveys were mailed to MT (BS) and MLT (AAS) graduates of the classes of 2003 and 2004. The survey resembles the one used by the Respiratory Care program in their recent APR process. A copy was sent to Institutional Research and Testing, asking for suggestions for improvement. When no response was received after two weeks, we moved ahead with mailing the survey and compiling the results.

An e-mail was sent to program graduates, warning them to watch for the survey and to return it as soon as possible. The e-mail also asked for their current address and for their current employer, to facilitate the mailing of the employer surveys. If graduates responded to the e-mail, the addresses that they provided were used to mail the actual survey. If there was no response, the survey was mailed to the last address shown on SIS.

Three surveys never reached the program graduates because no valid mailing address was available and no response was received from the e-mail. That left 23 surveys that can be expected to have reached program graduates. A second e-mail was sent a month after the survey was mailed, targeting those graduates who had not yet responded. This included an electronic copy of the survey. May 1, 2005 was chosen as the cutoff date for compiling responses.

Program	Graduates	Surveys mailed	Returned, undeliverable	Valid addresses	Responses	%
MT Class of 2004	16	16	1	15	9	60%
MT Class of 2003	5	5	1	4	1	25%
MLT Class of 2004	4	4	0	4	2	50%
MLT Class of 2003	1	1	1	0	0	0
Total	26	26	3	23	12	52.2%

Discussion: Our experience over many years has taught us that a 50% survey response is about the best we can expect. Many graduates remain in touch with program faculty. Some disappear. The Alumni Office is helpful with supplying addresses of program graduates; unfortunately, these addresses are often not valid. Our graduates are mostly female, which adds the additional complication that they marry and change their name. Having e-mail addresses seems to help with remaining in contact with our graduates; we got slightly better responses than in past years, and we were able to mail out employer surveys without having to wait for the graduate surveys to be returned.

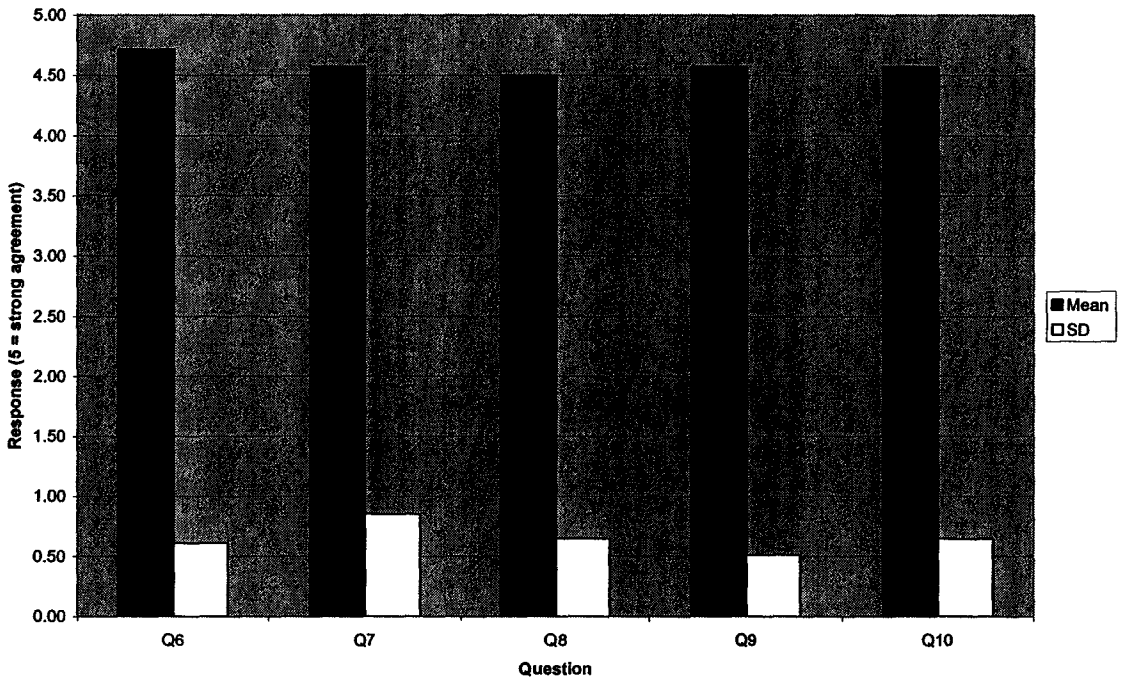
Questions 1 – 5 asked graduates about their job title, length of employment, conditions of employment (hours per week and hours per shift), and certification status. Graduates had been employed at their current job an average of just under 10 months at the time of the survey (mean 9.96 months, sd 4).. They averaged working 35 hours per week. Two graduates work 10 hour shifts; the rest work 8 hour shifts. All are nationally certified Medical Laboratory Technicians (AAS graduates) or Medical Technologists (BS graduates).

Because of the small number of program graduates, responses were combined for the two years (class of 2003 and 2004) and for the AAS and BS programs.

Questions 6 – 19 of the survey asked about graduates' impressions of the knowledge that they gained in the CLS program. A Likert Scale was used with ratings from 1 to 5, with 5 indicating strong agreement with the statement and 1 indicating strong disagreement with the statement. Graduates were generally pleased with the knowledge acquired in the CLS program:

Number	Question	Mean Response	SD
6	Knowledge appropriate to my current position	4.71	0.61
7	Knowledge appropriate to level of training	4.57	0.85
8	Knowledge to perform my duties efficiently	4.50	0.65
9	Knowledge to interpret test results	4.57	0.51
10	Trained to use sound judgment	4.57	0.65

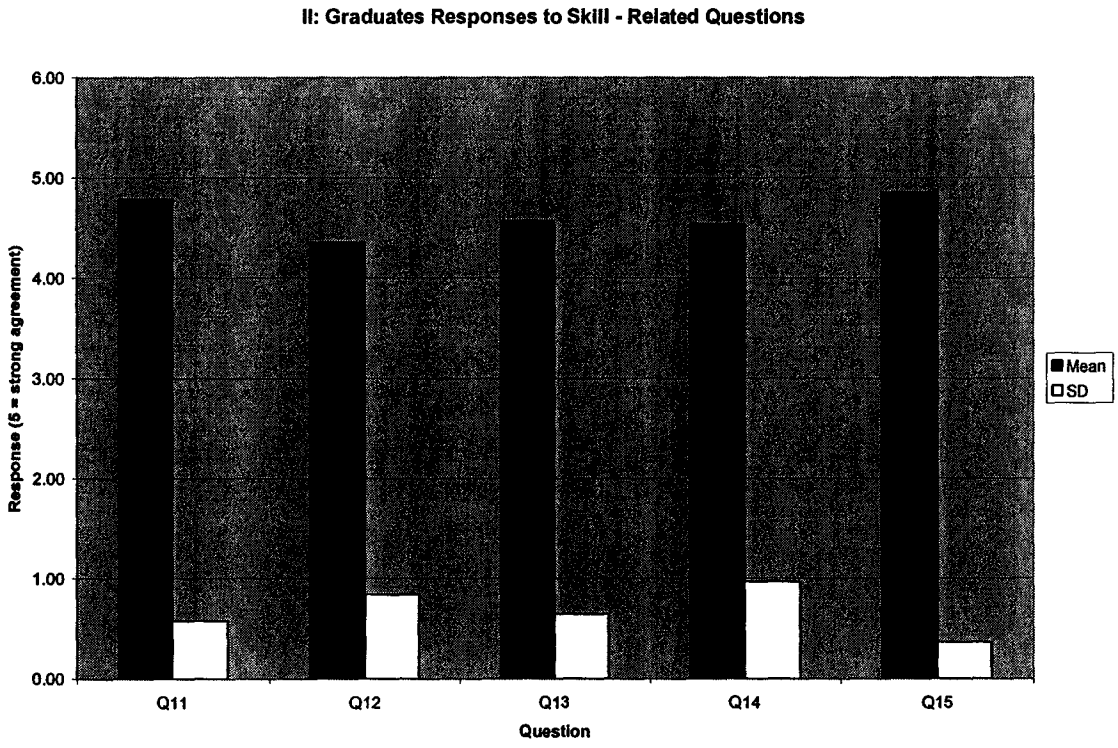
I: Graduates Responses to Questions about Job - Related Knowledge



Discussion: Mean scores of 4.5 or higher are strong indicators of student satisfaction with their education and believe that they have the knowledge to succeed on the job.

Questions 11 – 15 asked about graduates' impressions of their clinical skills acquired in the CLS program, again using a Likert Scale.

Number	Question	Mean Response	SD
11	Learned testing appropriate to my level of training	4.79	0.58
12	Learned to learn new analyzers/test systems easily	4.36	0.84
13	Learned to interpret test results appropriately	4.57	0.65
14	On – campus simulated lab prepared me for clinical experience	4.54	0.97
15	Clinical experience prepared me for current employment	4.86	0.36



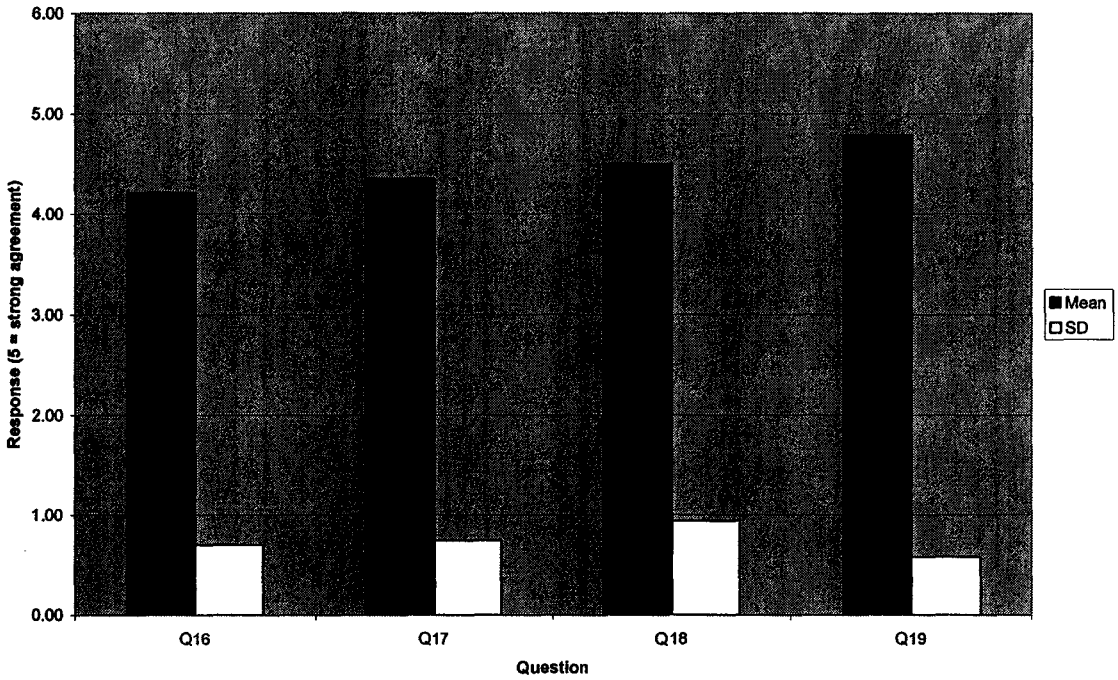
Discussion: Again, program graduates are satisfied to have learned the skills they need to perform on the job. The only question which they answered at less than 4.50 on a scale of 1 – 5 is the one about "learning to operate new analyzers/test systems easily." This is always an issue in clinical laboratory science, where the same tests may be performed on a number of different instrument platforms, depending upon the institution. Graduates who remain with the laboratory where they had their clinical internship are comfortable with the analyzers in use at that laboratory. If they accept employment in another lab, they may have to learn new analyzers.

The program's goal is to teach students to become comfortable with the operation of large automated analyzers, and to become aware that every clinical laboratory doesn't use the same analyzers that we have on campus, or the same analyzers as they learned on their internship. They are taught that everyone takes training and experience to become comfortable with new instrumentation. The employers of our graduates indicate that FSU graduates complete their orientation and training more quickly than graduates of other programs, so we believe that this concern on the part of new graduates is more apparent to them than it is a genuine problem.

Questions 16 – 19 asked graduates to comment on the behavioral skills they learned in the program:

Number	Question	Mean Response	SD
16	Prepared me to communicate effectively on the job	4.21	0.70
17	Prepared me to behave ethically and professionally	4.36	0.74
18	Taught me to manage time effectively	4.50	0.94
19	Encouraged me to apply for/pass national certification examinations	4.79	0.58

III: Graduate Responses to Questions about Behavioral Skills



Discussion: Graduates averaged over 4.0 on a 5 point scale for each question. However, we see some indication that they didn't expect to have to use professional behaviors and their communication skills as much as they really have to on the job and on-campus.. To address these issues, program faculty emphasize that simply performing tests is not enough; laboratory employees often need to communicate with nurses, physicians, and other health professionals, explaining what test results mean, what follow – up tests may be indicated, and what problems can occur if patients are not prepared properly for tests before they are performed. Opportunities for students to practice their communication skills are provided during the simulated laboratory where students are expected to respond to daily telephone calls and other opportunities to communicate. However, these experiences have been more difficult to accomplish as our faculty numbers have been reduced. Faculty have identified some other faculty and administrators who are willing to help us with this, and we will emphasize it more as we continue.

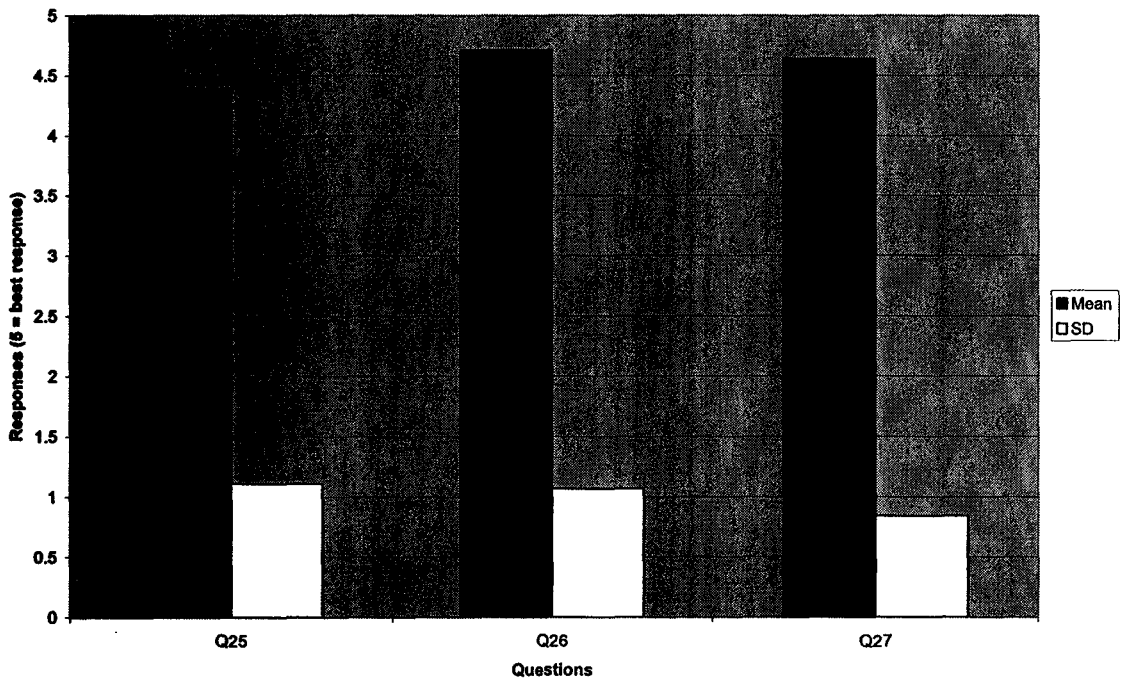
Questions 20 – 24 used a short answer format to ask about certification, continuing education, and graduates' participation in professional organizations

Number	Question	Yes	No
20	Actively pursued national certification	100%	0%
21	Participate in continuing education	100%	0%
22	Member of state professional organization	43%	57%
23	Member of ASCLS	43%	57%
24	Member of other national organization	36% (ASCP)	64%

Questions 25 – 27 asked graduates for their impressions of their academic advising, whether they would recommend the program to potential students, and whether they found it easy to gain employment after graduation.

Number	Question	Mean Response	SD
25	Academic advising was effective	4.39	1.11
26	I would recommend this program	4.71	1.06
27	It was easy to find employment	4.64	0.84

IV: Graduate Responses to General Questions



Discussion: Graduates were generally pleased with these aspects of their education. One graduate was unhappy with her academic advising. Responses to question 28 below correlate with questions 26 and 27 above.

Question 28 asked graduates to rate the overall quality of the program in preparing them to work in a clinical laboratory. Written comments from the graduates included:

Comment:	Number of Graduate Responses
Prepared me extremely well/superb	8
No comment	5
My employer actively seeks FSU grads	1

Question 29 asked graduates to identify 2 – 3 strengths of the program

Simulated lab	5
Instruments and trouble shooting	5
Hands on experience	3
Faculty	2
Everything	2
Course work related to real life	2
FSU grads more prepared to begin work than other program grads	1
Teaches you to be efficient	1
Prepares you for certification exam	1
Not having to find your own internship	1
Blood bank, differentials, body fluid cell ID, comparative methodology	1 each

Question 30 asked for 2 – 3 suggestions to improve the program.

More phlebotomy	5
More interaction with coworkers, nurses, others	5
Newer instruments	4
More sim lab	3
More hematology slides, body fluid cells, improve chemistry, flow cytometry, blood components, correlation of results, blood gases, automate microbiology	1 each
More LIS	1
More instrument maintenance	1

Question 31 asked what skills were expected that were NOT included in the program.

Cell counts on fluids	1
More courses to prepare for grad school	1
Political savvy	1
None	1

Question 32 asked for any other comments.

Sim lab was crucial	2
More time in sim lab	1
Could not be happier with my education	1
Good program	1
Show a video of urine with Trichomonas	1

Discussion: Ferris State University CLS graduates are attracted to the program because of the hands – on nature of their education. They do well with learning contemporary laboratory techniques on campus, respond well to a one semester clinical internship, and then easily find employment and succeed on the job. They recognize that the on – campus simulated laboratory prepares them well, teaching them organizational skills and giving them opportunities to trouble shoot stubborn instruments and unacceptable test results.

Several graduates indicated the need for more phlebotomy experience. With our recent curriculum revision, we have added a course in specimen collection and processing to the program. This removes the time consuming process of observing student phlebotomy from other course work, allowing both students and faculty to focus on this process.

Other specific suggestions tend to appear in both the "strengths" and the "suggestions to improve" listings (hematology slide examination, body fluid cell analysis). If one graduate thinks we need more of these topics and another thinks we need less, we are probably doing a reasonably effective job of covering the topic. When graduates can be so specific about suggestions, we also tend to believe that we are doing a good job of preparing them to succeed in a clinical laboratory.

B. Employer Follow-up survey

Surveys were mailed to all known current employers of MT and MLT graduates from the classes of 2003 and 2004. An e-mail was also sent to all graduates, asking them to supply the name of their direct supervisor. When responses were received, surveys were sent to these newly identified employers of graduates. A total of 22 surveys were mailed, and 14 responses received (63.6%). Because of the small numbers of graduates, responses were not separated into MT or MLT, or by year of graduation.

Most of the survey used is based on one designed by Clinical Laboratory Science educators at a national conference held in Chicago in 2001. The survey instrument was sent to Ferris State University's Office of Institutional Studies for their suggestions. No response was received, so after two weeks, the program went ahead with mailing the survey and compiling the results.

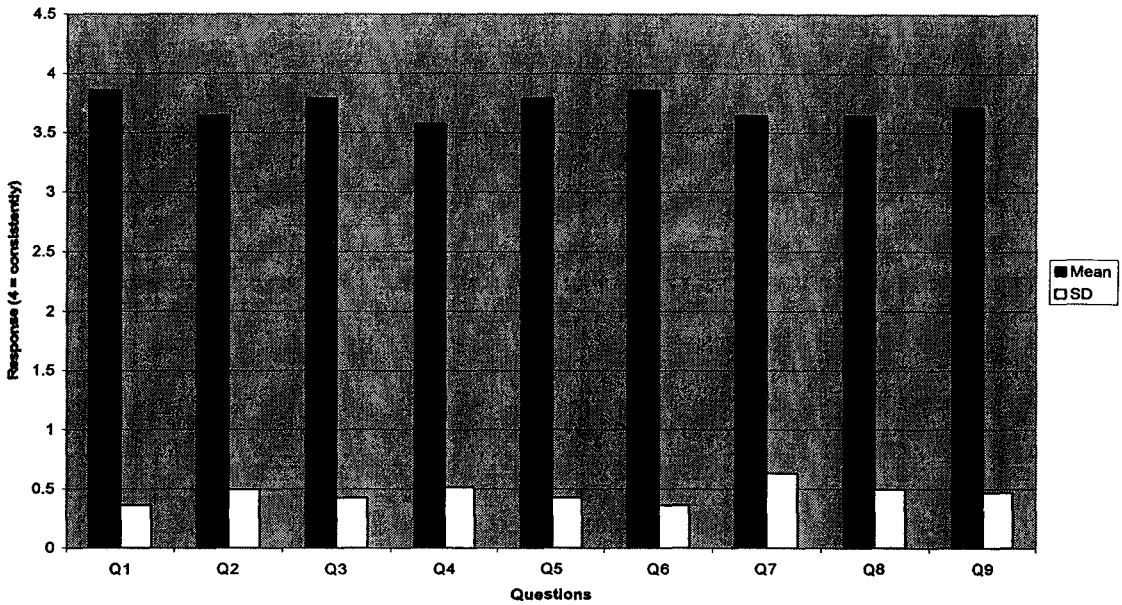
Program, year	Graduates	Direct knowledge of employer	Graduate provided info about employer	No information available	Surveys mailed	Surveys returned
MT 2004	16	9	6	1	15	10 (67%)
MT 2003	5	3	1	1	4	3 (75%)
MLT 2004	4	3	0	1	3	1 (33%)
MLT 2003	1	0	0	1	0	0 (9%)

Questions 1 – 14 comprise the national benchmark study developed at the meeting in Chicago. Employers use a Likert scale, where a response of 4 indicates that the graduate consistently demonstrates the skill or knowledge, and a response of 1 indicates that the graduate rarely displays the skill or knowledge.

Questions 1 – 9 ask employers to rate the program graduates on the following qualities:

Number	Question (The graduate):	Mean Response	SD
1	Demonstrates required technical skills	3.86	0.36
2	Applies theoretical knowledge	3.64	0.50
3	Meets workload demands after orientation	3.79	0.43
4	Solves problems/ troubleshoots	3.57	0.51
5	Prioritizes/organizes, and completes multiple tasks	3.79	0.43
6	Is adaptable and flexible	3.86	0.36
7	Shows a positive attitude	3.64	0.63
8	Interacts well with others	3.64	0.50
9	Functions as a team player	3.71	0.47

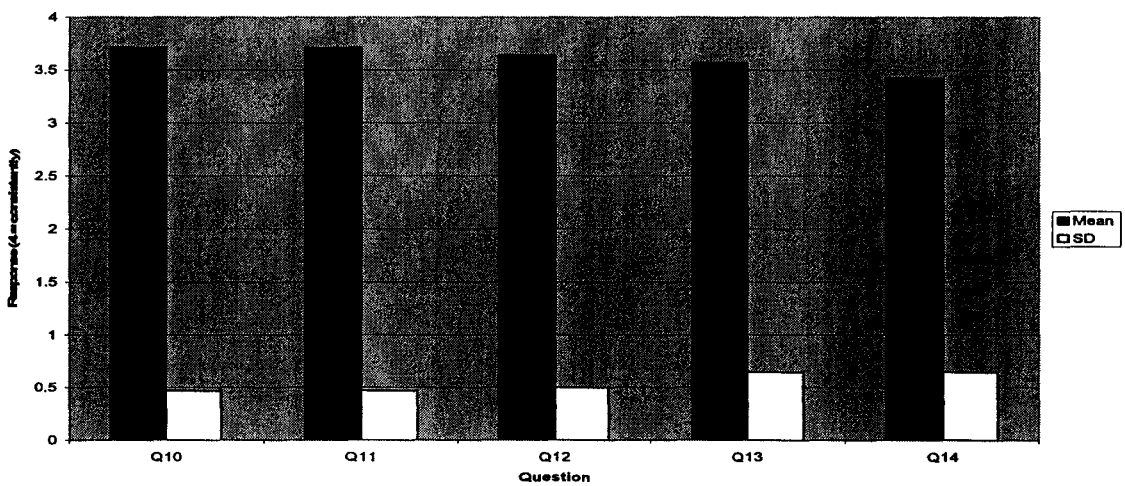
V: Employer Responses to Questions 1 - 9



Questions 10 – 14 covered other qualities prized by employers:

Number	Question (The graduate):	Mean Response	SD
11	Recognizes limitations/seeks help when appropriate	3.71	0.47
12	Shows initiative	3.64	0.50
13	Is customer – service oriented	3.57	0.65
14	Communicates effectively	3.43	0.65

VI: Employer Responses to Questions 10 - 14



Discussion: Employers express satisfaction with graduates of Ferris State University. The mean response for each question was 3.5 or higher except for question 14 (communicates effectively), which had a mean response of 3.43. Employers agree that the graduates of the programs would benefit from improved communication skills.

Question 15 asked where in the clinical laboratory our graduates were assigned to work. Of the 14 responses, nobody is assigned to cytology, histology, or to perform EKGs, which are not included in the Ferris State University CLS curriculum. Most graduates work in the core laboratory areas of hematology, clinical chemistry, and body fluid analysis, with slightly fewer assigned to blood bank and microbiology. These areas are somewhat less busy on evening and midnight shifts, so the lower numbers may indicate the hours our graduates work. Just under half of the graduates perform phlebotomy as part of the job.

Assigned to	Blood bank	Chemistry	Coagulation	Hematology	Immunology	Microbiology	Body fluids	Phlebotomy
Yes	8	12	12	13	7	7	11	6
No	6	2	2	1	7	7	3	8

Clearly, graduates of CLS at Ferris State University are assigned to several sections of the laboratory, and must be prepared to function as generalists, maintaining their skills and knowledge in most areas of the clinical laboratory.

Question 16 asked what other duties FSU graduates are assigned to perform:

Duty	Performs	Not assigned
Blood component processing	4	10
Complex problem solving	8	6
Consulting with other staff	8	6
Drawing blood donors	0	14
Evaluating new instruments	4	10
Instrument maintenance	14	0
Marketing lab services	0	14
Ordering supplies	1	13
Proficiency testing	12	2
QA team member	2	12
Quality control	10	4
Scheduling	0	14
Specimen collection	6	8
Specimen processing	9	5
Teaching students	1	13
Training staff	6	8

Discussion: Even after a short time on the job, Ferris State University graduates are performing higher-level tasks such as training staff, evaluating new instruments, and complex problem solving. Although it is our perception that more MT graduates are assigned to higher level tasks than MLT graduates, the small numbers of MLT graduates in recent years may skew the results.

Question 17 asked employers how FSU students could be better prepared. Comments included:

Very well prepared	5
FSU graduates are the best prepared I've ever hired	1
She's great	1
Need more multitasking skills	1
More blood gas	1
Need to send a checklist	1

Question 18 asked if there was any aspect where the FSU grad was not prepared. Suggestions included:

More phlebotomy experience	1
More preparation for high volume testing	1
Review quality control rules	1

The low number of suggestions indicates that the employers are very impressed with the preparation of the students. It is also interesting to note that we have begun to address the lack of phlebotomy experience by creating a course that is required by all CLLS students.

Question 19 asked if the employer would consider hiring another Ferris State University graduate. 100% of the employers answered yes to this question.

Question 20 asked for the laboratory's skills mix of employees. Most labs continue to hire 90% MTs and a smaller percentage of MLTs, though some employers indicate that this is because Michigan produces so few MLT graduates.

Question 21 asked if the employer had had difficulty hiring qualified personnel in the past two years. Eleven of the 14 respondents answered yes (78.6%).

Question 22 asked the employer to project hiring needs for the next 2 years. Virtually all employers express concern about an aging work force and the need for more graduates.

Question 23 asked for additional comments to improve the program.

Add specific tests to curriculum (various)	5
Continue problem solving practice	3
Multi tasking	3
Customer service, interpersonal skills	2
Continue sim lab	1
More QC review	1

Discussion: Employers of Ferris State University graduates continue to provide positive reinforcement for the program. There is considerable interest in hiring FSU graduates, and employers provide valuable feedback, indicating that the program prepares graduates well for the tasks they perform on the job. Ferris State University graduates are also recognized for their problem solving skills and their promotability (one MT graduate from 2004 already holds a supervisory position in her laboratory). Ferris State University graduates also compare well with other graduates from Michigan and around the nation.

C. Graduate Exit Survey

We have never done graduate exit surveys because the University Career Planning and Placement services do this. Furthermore, about 10 years ago we were instructed not to survey because it would interfere with their survey. These surveys have not been made available to the program.

D. Student Perceptions

This survey instrument is derived from the PROE survey and was administered during the winter semester 2005. Unfortunately, we had 10 students on internship who were not surveyed. Additionally, our survey was administered around the same time as the 4 SAI surveys each student is encouraged to complete. We feel that the "survey fatigue" may affect the responses. We forwarded the survey to IR and T for input but never received a response from them. Nevertheless, we administered the survey to 14 students and received 100% return rate.

STUDENT PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

INSTRUCTIONS: Rate each item using the following guide:

***6 Don't Know 5 Excellent** means nearly idea, top 5 to 10%*
4 Good is a strong rating, top one-third
3 Acceptable is average, the middle-third
2 Below Expectations is only fair, bottom one-third
1 Poor is seriously inadequate, bottom 5 to 10%
A comment column has been provided if you wish to explain your rating

Please rate each item below:	**Survey Item #**	**1**	**2**	**3**	**4**	**5**	**6**	**COMMENTS**
Courses in your occupational program are:								
• Available and conveniently located	1		1	5	1	7		
• Based on realistic prerequisites	2		1	2	5	5		
• Available at moderate cost	3	1	4	7		2		
Written objectives for courses in your occupational Program:								
• Are available to students.	4			1	1	12		
• Describe what you will learn in the course	5			1	1	12		
• Are used by the instructor to keep you aware of your progress	6			1	2	10		
Teaching methods, procedures and course content:								
• Meet your occupational needs, interests and objectives.	7				5	7	1	
• Provide supervised practice for developing job skills	8			1	3	8	1	
Related courses (such as English, Mathematics, Science) are:								
• Pertinent to occupational instruction	9			6	5	1	1	
• Current and meaningful to you	10			8	3	1	1	
Work experience (or clinical experience) in your Occupational program is:								
• Readily available at convenient locations.	11		1	1	3	5	3	
• Readily available to both day & evening students	12		1	2	1	3	6	
• Coordinated with classroom instruction	13				2	6	5	
• Coordinated with employer supervision	14			1	2	5	5	
Career planning information:								
• Meets your needs and interests	15			2	4	7		
• Helps you plan your program	16			2	3	8		
• Helps you make career decisions and choices	17			1	4	8		

Your rating		1	2	3	4	5	6	
Career planning information (Continued):								
• Helps you understand your rights and Responsibilities as an employee	18			2	3	5	3	
• Helps you evaluate job opportunities in relation to salary, benefits and conditions of employment	19			4	4	4	1	
• Is provided by knowledgeable, interested staff	20			2	3	8		
• Explains nontraditional occupational Opportunities for both sexes	21		1	3	2	4	3	
Job success information on former students in your occupational program:								
• Is provided to help you make career decisions	22	1	2	1	2	6	1	
• Indicates how many job opportunities there are in your occupation	23	1	2	1	3	6		
• Identifies where these job opportunities are located	24	1	1	1	3	5	2	
• Tells about job advancement opportunities	25	1		4	2	5	1	
Placement services are available to:								
• Help you find employment opportunities	26		1	1	3	4	4	
• Prepare you to apply for a job	27			1	3	4	5	
Occupational instructors:								
• Know the subject matter and occupational Requirements	28			1	1	9	2	
• Are available to provide help when you need it	29			1	1	9	2	
• Provide instruction so it is interesting and understandable	30			3	8	2	2	
Instructional support services (such as tutoring, lab assistance) are:								
• Available to meet your needs and interests	31			3	1	7	3	
• Provided by knowledgeable, interested staff	32			2	3	6	2	
Instructional lecture and laboratory facilities:								
• Provide adequate lighting, ventilation, heating, and other utilities	33		1	4	2	5		
• Include enough work stations for the number of students enrolled	34			3	2	8		
• Are safe, functional, and well maintained.	35			4	3	6		
• Are available on an equal basis for all students	36			2	5	6		
Instructional equipment is								
• Current and representative of industry	37		1	4	2	5	1	
• In sufficient quantity to avoid long delays in use	38		2	4	2	5		
• Safe and in good condition	39		2	3	2	6		
Instructional materials(e.g., textbooks, reference Books, supplies) are:								
• Available and conveniently located for use as needed	40			2	2	9		
• Current and meaningful to the subject	41			1	2	10		
• Not biased toward "traditional" sex roles	42			1	3	7	2	
• Available at reasonable cost	43		2	7	1	3		

Student Comments

Survey Item Number	Comment
1.	• Not convenient for commuter/employed student
2.	• People with experience shouldn't have to take CCHS courses
3.	• Tuition increase • Tuition high • Tuition has gone up too many times in the 3 years I've been here. I almost had to drop out (I know this is a problem everywhere) • Could be cheaper for non-degree courses
7.	• The CLS program does an excellent job of putting its student in "real life" situations before "real life" begins giving them an advantage to others entering the field.
8.	• Small class size allows for good supervision and Q & A.
11.	• My work experience allowed me to understand why things are the way they are.
12.	• Intern is after classes
15.	• I would like to know more about or how to continue my education in different parts of the laboratory
19	• This is an area that could be developed a bit more.
24.	• Posting of job opportunities is done all the time
26.	• Most of the time this is not needed. We usually get placed where we intern – it just happens that way.
33.	• It gets too hot for instrumentation. We just got new chairs and we are all very grateful.
34.	• Need more tables
35.	• Lab manager not stocking things like they need to be.
37.	• Some is good, some old. Need microscopes • Some instruments needs professional attention that costs a lot of money but would be worth it if we could get it. • If CLS cold have service contracts on the instruments

Discussion:

The results indicate that the students are satisfied with the courses in the CLS program. The majority feel the classes are conveniently located, although almost one-half feel there is room for improvement. We are addressing this concern by offering the MLT program and Phlebotomy certificate in a variety of off-campus sites. Thirty-six percent feel the tuition rates are too high, which we can do nothing about.

Almost all students feel that the course objectives are good to excellent and describe what they will learn. This has always been a strong point for our program. We also see a majority of students feel the teaching methods used are strong to nearly ideal. This indicates that students are comfortable with lecture and lab format of the CLS programs.

We see that only around one-half of the current students find the related courses (English, Math, Biology, and Chemistry) are pertinent, current and related to their profession. No specific reasons were given for their dissatisfaction.

Many students indicated that they do not know how to rate the clinical experience in the CLS programs. This makes sense since the vast majority of the students who took this survey have not been on internship yet. This may also explain some of the low ratings in regards to career planning. We try to keep the students informed of all the career opportunities available. Many jobs are posted on the WebCT discussions boards and the Michigan Society for Clinical Laboratory Sciences also maintains a job posting area.

It appears one of the areas we could improve is to inform them of job success of former students. This may be difficult since we may not know where graduates are currently employed. We do indicate to them that the new graduates seem to be finding jobs without much difficulty. We refer student to placement service when necessary, but most of the time the faculty are aware of jobs before the placement office does and we can post them to the WebCT discussion board or to the bulletin board outside our laboratories.

For the most part the students are satisfied with support services available to them. A few indicated they did not know what was available. We forward messages from the academic support services to the students and with implementation of MyFSU, there shouldn't be a reason students aren't acquainted with these services. Also, the faculty maintain regular office hours for those students who wish get some additional support.

About one-half of the students are happy with the instructional facilities available to them. The students sense the faculty's frustration with lack of professional maintenance of the instrumentation and indicated that with comments. They are grateful that we are doing are best, but don't understand the reluctance of the university to support the program with maintenance agreements because of fiscal restraints.

E. Faculty Perceptions

CLINICAL LABORATORY SCIENCES
FACULTY PERCEPTIONS OF PROGRAM

In April of 2005 two tenure track faculty and one clinical laboratory assistant for the Clinical Laboratory Sciences Program were surveyed as to their perceptions of the program. The Program Review in Occupational Education (PROE) survey instrument "Faculty Perceptions of Occupational Education Programs" was used for this review. The following is a summary of the results of the survey. The survey was sent to Institutional Research and Testing for input, but we did not receive a response before it had to be distributed. The tallied survey is attached in appendix D.

The overall rating for the Programs is good to excellent. The following are the areas of strength:

- Development of the curriculum – faculty have input
- Course objectives
- Competency based performance objectives
- Use of labor market needs
- Use of profession/industry standards
- Adaptation of instruction
- Provision of clinical experience
- Provision for the disadvantaged
- Efforts to achieve gender equity
- Provision for program advisement
- Career planning and guidance – done by faculty
- Provision for employability information – more than students use
- Placement effectiveness for students in the program – more jobs than graduates
- Provision for leadership and coordination
- Qualifications of administrators and supervisors
- Qualifications of instructional staff
- Use of instructional support staff
- Equipment and facilities
- Adequacy and availability of resources

The following are the areas of need/concern as noted by numerical response or written comment:

- Student follow-up information (better at following completers than leavers)
- Relevance of support courses (scheduling is an issue)
- Coordination with other community agencies and educational programs
- Provision for the handicapped – need for personal counselors for emotional support
- Promotion of this program – is improving with CAHS recruiter
- Instructional staffing – need faculty with specialty areas
- Professional development opportunities – funding is not going up but costs are
- Maintenance and safety of instructional equipment
- Scheduling of instructional facilities
- Use of advisory committees
- Provisions in capital outlay budget for equipment

Overall, the perceptions of the faculty and staff are favorable. Comments under "strengths of the program" pertain to well equipped laboratories, simulated laboratory, knowledge base of faculty, support from alumni, and support of clinical affiliates.

Concerns that were noted in the comments section under "major needs for improvement" pertain to staffing as the program expands and hiring adjuncts in specialty areas, recruitment of students, on-going maintenance of equipment, and maintaining quality programming with expansion.

F. Advisory Committee perceptions

We survey our Advisory Committee and education coordinators at our internships sites. We used an online survey tool, Zoomerang, and found it to be a useful tool for this type of project. Twenty surveys were email and 10 were returned. The results are in appendix D.

Discussion: The respondents are extremely happy with the CLS program. The comments praise the use of Simulated Laboratory. The are very satisfied with the quality of students we produce. Areas of improvement included better, well-maintained laboratory instrumentation and the addition of molecular techniques into the curriculum. The former has been addressed previously in this document. The latter will be a bit more difficult to satisfy. The faculty wrote a professional development grant to obtain training in molecular techniques used in the clinical laboratory, but it was not funded. We will need to resolve this issue before our next accreditation, since it is part of essentials. They have also been happy with the incorporation of WebCT for communication, document delivery and testing while the students are on clinical experience.

Section 3: Program Profile

Section 3: Program Profile

Administrative Program Review Program **Medical Laboratory Technology**

Purpose of Administrative Program Review

1. to facilitate a process led by the deans and department heads/chairs to assess and evaluate programs under their supervision
2. to facilitate long term planning and recommendations to the VPAA
3. to collect and analyze information that will be useful in the University's accreditation efforts; Academic Program Review deliberation; and assessment.

Instructions: Please prepare a report following the outline below.

I. Program Assessment/Assessment of Student Learning

a) What are the program's learning outcomes?

At the conclusion of the program students will be able to:

- **follow all safety policies of the laboratory, and to recognize and correct unsafe conditions**
- **work as members of the health care team**
- **maintain their technical competence under the normally stressful conditions in the clinical laboratory**
- **integrate theory and practice effectively**
- **generate data to be used in patient care, evaluate the validity of that data and assure reliability before reporting test results**
- **recognize the importance of quality control and quality assurance programs in the production of laboratory results**
- **collect and process samples of blood and other body fluids and evaluate the suitability of those samples for analysis**
- **perform routine tests and suggest additional follow-up or problem solving tests where needed**
- **maintain instruments and identify malfunctioning systems**
- **communicate effectively with other members of the health care team, with patients and with their families**
- **correlate results from all areas of the laboratory and relate those results to the clinical condition of the patient**
- **respect the confidentiality of patient data**
- **maintain neatness in personal habits, work areas and laboratory reports**
- **recognize the need for lifelong learning within the field of laboratory practice**

b) What assessment measures are used, both direct and indirect?

- **Student surveys and evaluations in CLLS courses**
- **Graduate surveys**
- **Employer surveys**
- **Advisory committee**
- **Scores on national certification examinations**
- **Bench marks set by the profession**

c) What is the assessment cycle for the program?
Assessment data is collected one year after graduation

d) What assessment data were collected in the past year?
There was only one 2003 graduate, and she wasn't surveyed in 2004. Surveys of grads of 2203/2004 have been mailed within the past 2 weeks. Info should be available by the end of April.

e) How have assessment data been used for programmatic or curricular change?
- **Assessment data was used as a basis for the curriculum revision completed during the 2004-2005 academic year.**
- **Assessment data is evaluated to determine needed changes in teaching methods within the professional level coursework.**

II. Course Outcomes Assessment

a) Do all multi-sectioned courses have common outcomes?
yes
b) If not, how do you plan to address discrepancies?
c) How do individual course outcomes meet programmatic goals?

The goals of the Medical Laboratory Technician Program at Ferris State University are:

1. To prepare graduates for employment in a variety of settings at career entry level. *Courses include didactic and laboratory experiences in all areas of the clinical laboratory: blood banking, clinical chemistry, hematology, coagulation, immunology, microbiology, and body fluid analysis.*

2. To define clearly what is expected of students at all levels of the program, to make these expectations clear to all students, and to help students meet these expectations. *Each course syllabus includes objectives, evaluation systems, program policies, and other information. The CLS program handbook (available online at*

3. To incorporate appropriate liberal arts, science, and Allied Health core courses in the curriculum and to educate professionals aware of the needs and values of a changing world. *The MLT program meets requirements for the AAS degree with appropriate science, liberal arts, and CAHS core courses.*

4. To provide evaluation mechanisms which recognize individual competence and allow for advanced placement when appropriate. *Each CLS course uses a variety of evaluation mechanisms: exams, laboratory exercises, presentations, so that each student's strengths can be measured.*

5. To provide the opportunity for worthwhile clinical experience for all qualified students. *All qualified students are assigned to a clinical laboratory for CLLS 291.*

6. To offer continuing education to medical laboratory professionals. *As the revised curriculum is implemented and if resources are made available for conversion to online format, didactic courses can be made available to practicing professionals to meet CE requirements. Program faculty also present at state and national meetings.*

III. Program Features

1. Advisory Board

a) Does the program have a board/committee? **Yes** When did it last meet? **May 2004?** Yes When were new members last appointed? **2003** What is the composition of the committee (how many alumni, workplace representatives, academic representatives, etc.)
- **4 workplace representatives who are not faculty**
- **1 academic representative in addition to the faculty**
- **One current MLT student; one of the workplace reps is an MLT grad.**

b) If no advisory board exists, please explain by what means faculty receive advice from employers and outside professionals to inform decisions within the program.

c) Has feedback from the Advisory Board affected programmatic or curricular change? **Advisory committee has expressed strong support for on campus laboratory and simulated lab training. This prepares students for their brief internship experience.**

2. **Internships/Cooperative or Experiential Learning**
   a) Is an internship required or recommended? **required**
   b) If the internship is only recommended, what percentage of majors elect the internship option?
   c) What challenges does the program face in regard to internships? **There have not been problems placing students in the internship site—the interns from the Ferris program are in high demand.** What is being done to address these concerns? **The internship has been shortened and students are required to participate in a simulated laboratory experience on campus prior to their assignment to the internship setting. Internship has been moved from summer to winter semester to accommodate labs with small staffs.**
   d) Do you seek feedback from internship supervisors ? **Yes**

If so, does that feedback affect pedagogical or curricular change? **As a result of feedback from the internship supervisors, the following actions have been taken: CLLS 121 for phlebotomy was added, a simulated laboratory course to give students expertise in running computerized systems was added, instrumentation function checks and daily maintenance of equipment was added to coursework.**

3. **On-Line Courses**
   a) Please list the web-based courses, both partial internet and fully online, offered last year. **CLLS 101, CLLS 224, CLS 228, CLLS 230, SCCL 240, CLLS 291 CLLS 235, 251, a little bit in CLLS 215.**
   b) What challenges and/or opportunities has web-based instruction created?
   Web based instruction has provided several challenges for the faculty within the programs: There has been minimal support for course development and updates in a rapidly changing field. Until this year, students were unable to receive instruction regarding how online instruction works. What faculty development opportunities have been encouraged/required in order to enhance web-based learning within the program? **Faculty have been encouraged to attend web development workshops, however, they have not availed themselves of the opportunities presented.**
   c) How has student feed-back been used to enhance course delivery? **As a result of student feedback, CLLS 240 will be going to a mixed delivery format in the future.**
   d) Is there any plan to offer this program on-line? If yes, what rationale is there to offer this program online?" (emerging market opportunity?, expand enrollment?, demand for niche program offering?, etc.) **Plans are being considered to offer the didactic portion of the curriculum in a partial internet modality. There is high demand for clinical laboratory personnel in educationally underserved portions of Michigan, specifically in Northern Michigan. The conversion of the courses to a partially on-line format will enable the program to expand its enrollment in addition to meeting the work force needs of the state.**

4. **Accreditation**
   a) Is the program accredited or certified? **accredited**
   b) By whom? **National Accrediting Agency for Clinical Laboratory Sciences**
   c) When is the next review? **2007**
   d) When is the self-study due? **2006**
   e) How has the most recent accreditation review affected the program? **At the time of the most recent accreditation, no citations or suggestions for improvement were made.**

5. **Student/Faculty Recognition**

a) Have students within the program received any special recognition or achievement? **No.** Have faculty within the program received any special recognition or achievement? **Barbara Ross, program coordinator, was awarded the certificate of excellence in the Master of Science in Clinical Systems from the University of Medicine and Dentistry of New Jersey.**

6. **Student Engagement**

a) Is volunteerism and student engagement a structured part of the program? **No**
b) Does the program utilize service learning in the curriculum? **No**
c) Does the program participate in the American Democracy Project? **No**

Areas of Strength:

- **Laboratory facilities with state of the art equipment allowing students to gain proficiency on campus prior to enrollment in the internship**
- **One of the only programs within the state with a laboratory information system**
- **Experienced faculty who are active in professional organizations**
- **State-wide internship opportunities**
- **Strong support from clinical affiliates and advisory committee**

Areas of Concern (and proposed actions to address them)

- **Continued low enrollment- although enrollment is slowly increasing, it does not yet meet the established capacity for the program. To address this issue, the program faculty will continue to work with the college recruiter to recruit students from high schools, career technical schools and community colleges by visiting classrooms and participating in health career days, health fairs and the on-campus Dawg Days. Additionally, plans are being made to take the program to off-campus sites.**
- **Identification of qualified supplemental faculty to cover courses. To address this issue, position postings for supplemental faculty will be placed on the Ferris Website.**

Future Goals:

- **Continue to increase enrollment until the established capacity for the program has been reached.**
- **Offer the phlebotomy certificate in Northern Michigan during the 2005-2006 academic year**
- **Offer the MLT program in Northern Michigan during the 2005-2006 academic year**
- **Complete self study in preparation for accreditation on-site visit in 2007.**
- **Earn national program approval for phlebotomy program.**

Other Recommendations:

Administrative Program Review Program__**Medical Technology**_____

Purpose of Administrative Program Review

4. to facilitate a process led by the deans and department heads/chairs to assess and evaluate programs under their supervision
5. to facilitate long term planning and recommendations to the VPAA
6. to collect and analyze information that will be useful in the University's accreditation efforts; Academic Program Review deliberation; and assessment.

Instructions: Please prepare a report following the outline below.

IV. Program Assessment/Assessment of Student Learning

f) What are the program's learning outcomes?

At the conclusion of the program students will be able to:

- **follow all safety policies of the laboratory, and to recognize and correct unsafe conditions**
- **work as members of the health care team**
- **maintain their technical competence under the normally stressful conditions in the clinical laboratory**
- **integrate theory and practice effectively**
- **generate data to be used in patient care, evaluate the validity of that data and assure reliability before reporting test results**
- **recognize the importance of quality control and quality assurance programs in the production of laboratory results**
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- **correlate results from all areas of the laboratory and relate those results to the clinical condition of the patient**
- **respect the confidentiality of patient data**
- **maintain neatness in personal habits, work areas and laboratory reports**
- **recognize the need for lifelong learning within the field of laboratory practice**

g) What assessment measures are used, both direct and indirect?

- **Student surveys and evaluations in CLLS courses**
- **Graduate surveys**
- **Employer surveys**
- **Advisory committee**
- **Scores on national certification examinations**
- **Bench marks set by the profession**

h) What is the assessment cycle for the program?

Assessment data is collected one year after graduation

i) What assessment data were collected in the past year?

The surveys for the 2004 graduates is currently underway

j) How have assessment data been used for programmatic or curricular change?

- **Assessment data was used as a basis for the curriculum revision completed during the 2004-2005 academic year.**
- **Assessment data is evaluated to determine needed changes in teaching methods within the professional level coursework.**

V. Course Outcomes Assessment

d) Do all multi-sectioned courses have common outcomes? **Yes**
e) If not, how do you plan to address discrepancies?
f) How do individual course outcomes meet programmatic goals?

The goals of the Medical Technology Program at Ferris State University are:

7. **To prepare graduates for employment in a variety of settings at career entry level.** ***Courses include didactic and laboratory experiences in all areas of the clinical laboratory: blood banking, clinical chemistry, hematology, coagulation, immunology, microbiology, and body fluid analysis.***
8. **To define clearly what is expected of students at all levels of the program, to make these expectations clear to all students, and to help students meet these expectations.** ***Each course syllabus includes objectives, evaluation systems, program policies, and other information.***
9. **To incorporate appropriate liberal arts, science, and Allied Health core courses in the curriculum and to educate professionals aware of the needs and values of a changing world.** ***The MT program meets requirements for the BS degree with appropriate science, liberal arts, and CAHS core courses.***
10. **To provide evaluation mechanisms which recognize individual competence and allow for advanced placement when appropriate.** ***Each CLS course uses a variety of evaluation mechanisms: exams, laboratory exercises, presentations, so that each student's strengths can be measured.***
11. **To provide the opportunity for worthwhile clinical experience for all qualified students.** ***All qualified students are assigned to a clinical laboratory for CLLS 491.***
12. **To offer continuing education to medical laboratory professionals.** ***As the revised curriculum is implemented and if resources are made available for conversion to online format, didactic courses can be made available to practicing professionals to meet continuing education requirements.***

VI. Program Features

6. Advisory Board

d) Does the program have a board/committee? **Yes** When did it last meet? **May 2004?** Yes When were new members last appointed? **2003** What is the composition of the committee (how many alumni, workplace representatives, academic representatives, etc.)
   - **4 workplace representatives who are not faculty**
   - **1 academic representative in addition to the faculty**
   - **One current MT student; one of the workplace reps is an MT grad.**

e) If no advisory board exists, please explain by what means faculty receive advice from employers and outside professionals to inform decisions within the program.
f) Has feedback from the Advisory Board affected programmatic or curricular change? **Advisory committee has expressed strong support for on campus laboratory and simulated lab training. This prepares students for their brief internship experience.**

7. Internships/Cooperative or Experiential Learning

e) Is an internship required or recommended? **required**
f) If the internship is only recommended, what percentage of majors elect the internship option?

g) What challenges does the program face in regard to internships? **There have not been problems placing students in the internship site—the interns from the Ferris program are in high demand.** What is being done to address these concerns? **The internship has been shortened and students are required to participate in a simulated laboratory experience on campus prior to their assignment to the internship setting.**

h) Do you seek feedback from internship supervisors ? **Yes**

If so, does that feedback affect pedagogical or curricular change? **As a result of feedback from the internship supervisors, the following actions have been taken: CLLS 121 for phlebotomy was added, a simulated laboratory course to give students expertise in running computerized systems was added, instrumentation function checks and daily maintenance of equipment was added to coursework.**

8. On-Line Courses

e) Please list the web-based courses, both partial internet and fully online, offered last year. **CLLS 101, CLLS 224, CLS 228, CLLS 230, CCLS 240, CLLS 291 CLLS 235, 251, CLLS 430, 435, a little bit in CLLS 215, CLLS 491.**

f) What challenges and/or opportunities has web-based instruction created? **Web based instruction has provided several challenges for the faculty within the programs: There has been minimal support for course development and updates in a rapidly changing field. Until this year, students were unable to receive instruction regarding how online instruction works.** What faculty development opportunities have been encouraged/required in order to enhance web-based learning within the program? **Faculty have been encouraged to attend web development workshops, however, they have not availed themselves of the opportunities presented.**

g) How has student feed-back been used to enhance course delivery? **As a result of student feedback, CLLS 240 will be going to a mixed delivery format in the future. CLLS 430 is mixed delivery format**

h) Is there any plan to offer this program on-line? If yes, what rationale is there to offer this program online?" (emerging market opportunity?, expand enrollment?, demand for niche program offering?, etc.) **Consideration may be given in the future to the development of an on-line MLT to MT completion option. This will depend upon the manner in which the MLT on-line program is accepted as well as national norms.**

9. Accreditation

f) Is the program accredited or certified? **accredited**

g) By whom? **National Accrediting Agency for Clinical Laboratory Sciences**

h) When is the next review? **2007**

i) When is the self-study due? **2006**

j) How has the most recent accreditation review affected the program? **At the time of the most recent accreditation, no citations or suggestions for improvement were made.**

10. Student/Faculty Recognition

b) Have students within the program received any special recognition or achievement? **Katherine Jones, MT 2004, won the statewide student individual competition. The team of Sarah Barnes, Molly Haigh, Amy Klenk, and Lynn Tyckoski, all MT 2004, won first place in the statewide student team competition.** Have faculty within the program received any special recognition or achievement? **Barbara Ross, program coordinator, was awarded the certificate of excellence in the Master of Science in Clinical Systems from the University of Medicine and Dentistry of New Jersey.**

6. **Student Engagement**

a) Is volunteerism and student engagement a structured part of the program? **No**

b) Does the program utilize service learning in the curriculum? **No**
c) Does the program participate in the American Democracy Project? **No**

Areas of Strength:

- **Laboratory facilities with state of the art equipment allowing students to gain proficiency on campus prior to enrollment in the internship**
- **One of the only programs within the state with a laboratory information system**
- **Experienced faculty who are active in professional organizations**
- **State-wide internship opportunities**
- **Strong support from clinical affiliates and advisory committee**

:

Areas of Concern (and proposed actions to address them)

- **Continued low enrollment- although enrollment is slowly increasing, it does not yet meet the established capacity for the program. To address this issue, the program faculty will continue to work with the college recruiter to recruit students from high schools, career technical schools and community colleges by visiting classrooms and participating in health career days, health fairs and the on-campus Dawg Days. Additionally, plans are being made to take the program to off-campus sites.**
- **Identification of qualified supplemental faculty to cover courses. To address this issue, position postings for supplemental faculty will be placed on the Ferris Website.**

Future Goals:

Other Recommendations:

A. Profile of Students

1 a-f) Student Demographic Profile: Medical Technology, BS, (MT) Program (including Pre-MT)

		2000		2001		2002		2003		2004	
		PMT(%)	MT(%)	PMT(%)	MT(%)	PMT(%)	MT(%)	PMT(%)	MT(%)	PMT(%)	MT(%)
Sex	Male	1(25.0)	4(11.0)	2(50.0)	5(15.0)	4(50.0)	5(16.0)	2(33.3)	7(22.0)	0(0.0)	12(41.0)
	Female	3(75.0)	31(89.0)	2(50.0)	28(85.0)	4(50.0)	27(84.0)	4(66.7)	26(78.0)	3(100.0)	17(59.0)
Race	Black	3(75.0)	3	2(50.0)	3	2	3	2	1	0	0
	Hispanic	0(100.0)	1	0(100.0)	1	0	2	0	2	1	1
	Indian/Alaskan	0(100.0)	1	0(100.0)	1	0	0	0	0	0	0
	Asian/Pac Isl.	0(100.0)	1	0(100.0)	1	0	0	0	0	0	1
	White	1(25.0)	24	2(50.0)	24	6	26	4	30	2	27
	Foreign	0(0.0)	4	0	2	0	0	0	0	0	0
	No Response	0(0.0)	1	0	1	0	1	0	0	0	0
Age	Avg. Age	22.3	22.4	30.3	21.9	19.4	21.6	23.7	22.3	29.7	23.2
Residence	In-state	4(100.0)	29	4	29	8	30	5	32	3	28
	Out-of-State*	0(0.0)	6	0	4	0	2	1	1	0	1
Enrollment Status	Full-Time	4(100.0)	30	4	31	8	31	6	31	1	24
	Part-Time	0(0.0)	5	0	2	0	1	0	2	2	5
	Day	4(100)	35	4	33	8	32	6	33	3	29
	Evening	0(0.0)	0	0	0	0	0	0	0	0	0
	Weekends	0(0.0)	0	0	0	0	0	0	0	0	0
	On-Campus	4(100.0)	35	4	33	8	32	6	33	3	29
	Off-Campus	0(0.0)	0	0	0	0	0	0	0	0	0
Course delivery method	100% on-line	0	0	0	0	0	0	0	0	0	0
	Mixed delivery	0	0	0	0	0	0	0	0	0	11

* includes Midwest Compact Students

A. Profile of Students

1 a-f)Student Demographic Profile: Medical Laboratory Technology, (MLT) AAS, Program (including Pre-MLT)

		2000		2001		2002		2003		2004	
		PMLT(%)	MLT(%)	PMLT(%)	MLT(%)	PLMT(%)	MLT(%)	PMLT(%)	MLT(%)	PMLT(%)	MLT(%)
Sex	Male	1	0	3	0	3	2	1	3	1	3
	Female	2	4	3	8	9	5	3	7	1	5
Race	Black	1	0	2	0	2	0	0	0	0	1
	Hispanic	0	0	0	0	0	0	0	1	0	1
	Indian/Alaskan	0	0	0	0	0	0	0	0	0	0
	Asian/Pac Isl.	0	0	1	0	1	0	0	0	0	0
	White	2	4	3	7	9	5	4	8	2	6
	Foreign	0	0	0	1	0	2	0	1	0	0
	No Response	0	0	0	0	0	0	0	0	0	0
Age	Avg. Age	18.7	23.8	18.8	20.8	19.6	22.9	22.5	23.2	23.5	24.5
Residence	In-state	3	4	6	7	11	5	4	9	2	7
	Out-of-State*	0	0	0	1	1	2	0	1	0	1
Enrollment Status	Full-Time	2	3	5	6	11	5	4	9	1	7
	Part-Time	1	1	1	2	1	2	0	1	1	1
	Day	3	4	6	8	12	7	4	10	2	8
	Evening	0	0	0	0	0	0	0	0	0	0
	Weekends	0	0	0	0	0	0	0	0	0	0
	On-Campus	3	4	6	8	12	7	4	10	2	8
	Off-Campus	0	0	0	0	0	0	0	0	0	0
Course delivery method	100% on-line	0	0	0	0	0	0	0	0	0	0
	Mixed delivery	0	0	0	0	0	0	0	0	1	1

* Includes Midwest Compact Students

A. Profile of Students

1 a-f) Student Demographic Profile: Phlebotomy (C)

The profile of the students in the Phlebotomy is not available. In addition, some of the students enrolled in CLLS121 do not intend to complete the Phlebotomy certificate.

g) Discussion: Nationwide, enrollments in CLS programs have been, anecdotally, on the increase of the past couple of years. That is reflected in our anticipated enrollment numbers for 2005-2006, which appear to be up compared to one year ago. The increase in our student numbers are due to the efforts of the CAHS recruiter along with recruiting efforts of the faculty. We have found that introducing the undergraduate students in the College of Arts and Sciences to our programs during their first year of chemistry has had a role in our increased numbers. We also see an increase in inquiries for the MT program by pre-pharmacy or pre-optometry students who were not selected for the next class. Additionally, we have included the phlebotomy certificate to create a potential career ladder to provide access to new student populations including high school students and displaced workers.

The students in the MT and MLT program are full-time, day students and come from within Michigan. Consequently, all but one of our internships sites are in Michigan. This is a benefit to the state because almost all the students remain in the state immediately after their internship is completed. In contrast, many of students in the Phlebotomy program are non-traditional, including working adults. To accommodate them many of the courses have been offered in the evening and on-line. Like the MT and MLT programs, all the internships sites for the Phlebotomy certificate are in state. Since MT and MLT students are full-time they are able to finish the degree in the recommended time, if they so choose. However, since some of the phlebotomy students are working adults, they may elect to take extra time to finish the certificate.

The workforce in the medical laboratory field has been traditionally made up of women. This is reflected in the demographics for our programs. The number of male students enrolled in CLS varies from year to year, so there really is no trend; however, we may enroll a higher percentage of males than many of the other CAHS programs. Whether the students are male or female has no impact on our curriculum.

In recent years, we have seen a few more students from outside of Michigan, and the U.S., enroll in the CLS programs. The reasoning behind this includes lack of programs in their area, the positive reputation of our program, and a daughter of an alumnus. We have also been contacted by hospitals in other states that are in search of students for internship as well as graduates.

There has been recent interest in our Phlebotomy certificate and MLT degree from displaced workers. The impact on the curriculum will mean that we will need to hire instructors for the courses. We cannot comment on the demographics of these students at this time.

2 a-b) Quality of Students - Medical Technology, BS, (MT) Program (including Pre-MT)

		2000		2001		2002		2003		2004	
		PMT	MT	PMT	MT	PMT	MT	PMT	MT	PMT	MT
GPA	Range	2.267-2.35	1.233-4	1.725-2.343	2.015-4	2.156-2.654	2.44-3.944	2.151-2.8	2.421-3.96	2.558-3.354	1.968-3.669
	Average	2.308	2.871	1.914	3.223	2.432	3.266	2.433	3.206	2.956	3.027
ACT	Range	13-20	17-30	13-25	15-32	17-25	17-32	14-25	17-32	14-17	14-32
	Average	17	24	19	24.1	20.1	24.3	19	24.6	15.5	22.5
GPA (Graduated)	Range	N/A	2.629-3.57	N/A	2.66-3.949	N/A	2.684-3.936	N/A	2.73-3.969	N/A	**No Data**
	Average	N/A	3.021	N/A	3.183	N/A	3.321	N/A	3.385	N/A	**No Data**
ACT (Graduated)	Range	N/A	16-29	N/A	18-27	N/A	17-30	N/A	18-29	N/A	**No Data**
	Average	N/A	24.7	N/A	22.1	N/A	24	N/A	24.8	N/A	**No Data**

2 a-b) Quality of Students - Medical Laboratory Technology, AAS, (MLT) Program (including Pre-MLT)

		2000		2001		2002		2003		2004	
		PMLT	MLT	PMLT	MLT	PMLT	MLT	PMLT	MLT	PMLT	MLT
GPA	Range	1.952-2.244	3.905-3.905	1.738-2.779	2.17-2.945	1.886-2.52	2.359-3.544	2.053-2.372	0.858-4	2.184-2.325	2.208-3.414
	Average	2.098	3.905	2.28	2.548	2.188	2.759	2.212	2.589	2.254	2.208
ACT	Range	19-19	16-26	12-21	19-31	12-25	19-30	15-22	14-23	18-18	14-26
	Average	19	21.7	17.2	24.2	17.5	22.8	17.7	19.9	18	20.8
GPA (Graduated)	Average	N/A	**No Data**	N/A	2.19-2.684	N/A	2.608-2.608	N/A	2.378-3.053	N/A	**No Data**
	Range	N/A	**No Data**	N/A	2.429	N/A	2.608	N/A	2.699	N/A	**No Data**
ACT (Graduated)	Average	N/A	**No Data**	N/A	18-26	N/A	27-27	N/A	16-23	N/A	**No Data**
	Range	N/A	**No Data**	N/A	22	N/A	27	N/A	19.5	N/A	**No Data**

2 a-b) Quality of Students – Phlebotomy (C)

Students in the Phlebotomy certificate program are required to have a HS diploma and not required to submit an ACT score, but if they do have an ACT score it could be used to identify those students who require additional help in reading or math.

c) In addition to ACT and GPA we do not use any other methods to assess the quality of students entering the programs. We do however require students to earn a C or better in BIOL205 and CHEM214 to progress in the program. This is based on a study of indicators of student success in the CLS programs. We have learned that a student who earns less than a C in the courses with a CLLS prefix tend not to be as successful on internship as those who earn a grade of C or better. The less than average student typically requires more one on one work during the internship, which may not be available due to staffing reductions in some labs.

d) Academic awards earned by students in the CLS programs include the American Society for Clinical Laboratory Sciences (ASCLS) scholarship, Andrea Warfield Scholarship for non-traditional students and the Call scholarship for Allied Health students. These awards bring regional and national attention to the high quality, dedicated and involved CLS students we attract to the program.

e) Scholarly activities/creative activities in which the CLS students participated:

- Michigan Society for Clinical Laboratory Science (MSCLS) meetings where they are able to participate, along with professionals in the field, in continuing education sessions
- Two student representatives for MSCLS
- Student representative at the ASCLS National Membership meeting.
- Poster presentations at MSCLS, including a second and third prize
- MSCLS student competition individual first place
- MSCLS student competition team first place
- Central Michigan Association of Medical Technologists meetings where they are able to participate in continuing education sessions
- The Association of Clinical Laboratory Science Students sponsors a speaker for the Central Michigan Association of Medical Technologist meeting. The meetings are held in Mt. Pleasant each month.

All of these activities are models for professional behavior. The degree is not the end of the education.

f) Other Significant Student Accomplishments

- Leader of the FSU Pep band
- Involved with Kappa Psi, including president of the FSU chapter and participation at the national level.
- Student tutors
- Student Ambassador
- Involved in CAHS Summer camp

These activities put students in leadership positions.

3) Employability of Students (MT and MLT)

a) 88% of graduates have become employed full-time in the field within one year of receiving their degree. 3% have been lost to follow-up and 1.5% not employed yet. This shows the demand for highly trained clinical laboratory scientists. We do not have any data about the Phlebotomy certificate graduates.

b) The average salary of graduates who become employed full-time in the field is $ 20.40/hr for MT and $16.12 for MLT graduates. This is a 22% increase for MT graduates and 20% increase for MLT graduates since our last APR and shows the shortage of qualified clinical laboratory science is helping to drive up salaries. The

increases we have seen in Michigan directly mirror the national trend of increased salaries.

c) 6% of graduates have become employed as part-time or temporary clinical laboratory scientists within one year of receiving their degree. This number reflects 4 MLT graduates who are completing the MT degree at Ferris.

d) Many of our students commit to jobs before the end of their internships and do not require career assistance. If the student does require assistance it often begins with advising from a faculty member who may direct them to a potential employer. They also are encouraged to attend on-campus job fairs if their schedule permits, although many times they are off-campus. Refer to the results of the student perceptions survey.

e) 61 graduates (92.5%) continue to be employed in the field. This high percentage shows a dedication to the career.

f) 83% of MT graduates remain Michigan, while 100% of MLT graduates remain in Michigan. This high percentage shows the strong sense of loyalty to family and concern for quality health care in Michigan.

g) On average 1-2 MT students and 0-3 graduates (per year) go on for additional education training. Those that enrolled in graduate school are attending universities within the state of Michigan. This low number may also indicate the student's dedication to the profession, and the career opportunities available to them with their bachelor's degree.

h) All of the graduates who continue their educational training enroll in universities in Michigan, including the MLT graduates who continue their education at Ferris. Students attend graduate programs at the University of Michigan, Wayne State University, Central Michigan University and Western Michigan University.

B. Enrollment

1. Anticipated Fall enrollment, as of July 10, 2005.

PMT:	6
MT:	46
PMLT:	4
MLT:	15
Phlebotomy:	16

2. Enrollment and SCH Trends

The numbers listed in the table below are from the FSU Fact book.

	Fall 2000		Fall 2001		Fall 2002		Fall 2003		Fall 2004	
	Enrollment	SCH	Enrollment	SCH	Enrollment	SCH	Enrollment	SCH	Enrollment	SCH
PMLT	No data		No data		No data		No data		No data	
MLT	4	51	8	101	7	90	10	129	8	101
PMT	4	49	4	54	8	111	6	83	3	33
MT	35	486	33	495	32	464	33	473	29	393
Phlebotomy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Total		586		650		665		685		527

According to the university data our enrollment has remained below program capacity but relatively stable since our last program review. The number of SCH is related to the number of students enrolled. If the increase in the number of faculty advisees is an indication of an upward trend then the university will see an improvement in our enrollment beginning with the next edition of the FSU Fact Book. The numbers reflect fall semester totals. Efforts are currently underway to further increase the enrollment including the development of the phlebotomy certificate and offering the certificate at off-campus sites.

3. The CLS program does not have a formal application process. If the student meets the admission criteria they are admitted. Since our program has not been at capacity all qualified students have been admitted. Since our last APR we have had 100 students enroll in our Orientation to Clinical Laboratory Science course. Seventy-five percent have continued and completed their respective program.

4. Those students who apply and meet admission criteria are admitted to the MT or MLT program. Those who do not meet admission criteria are placed into pre-MT or pre-MLT until they meet admission criteria.

5. Of those who are admitted, 100% enroll.

6. Currently, the CLS enrollment goal is 10% increase per year. We use a variety of strategies to increase/maintain enrollment:

Strategy for Increasing Enrollment	Person(s) Responsible
Open Lab Days	CLS Faculty
Monthly Informational sessions	CLS Faculty
Visits to CHEM121/321 classroom	CLS Faculty
Career Fairs	CAHS Recruiter, CLS Alumni
High School Visits	CAHS Recruiter, CLS Alumni
Community College Visits	CAHS Recruiter, CLS Alumni
Dawg Days	CAHS Recruiter, CLS Faculty
Off-campus phlebotomy certificate	Adjunct faculty

Strategy for Increasing Retention	Person(s) Responsible
Advising	CLS Faculty
Hands-on laboratory courses	CLS Faculty
Variety of teaching methods	CLS Faculty
Active student organization	CLS students, Faculty advisor
Progression policy	CLS Faculty
Off-campus phlebotomy certificate	Adjunct faculty

We feel that the most successful strategy to increase on-campus enrollment is the visits to the undergraduate chemistry courses. Each year we recruit several qualified students who are not accepted into pharmacy or optometry school and are searching for a program to which their credits will transfer. The phlebotomy certificate is currently offered off-campus in Grand Rapids and northern Michigan, Fall 2005.

C. Program Capacity

1. The appropriate program enrollment capacity for the CLS programs is 16 students per laboratory section and 32 per lecture section. Limitations to our enrollment capacity are:
    a. Available faculty
    b. Student safety concerns in the laboratory
    c. Available laboratory space
    d. Actual numbers of instruments for students to operate
    e. Limited number of affiliated hospital laboratory sites. This could be an issue as enrollment increases.

    Note: Enrollment capacity is 30 per year for a total of 120. Additional faculty would be required if the program nears capacity.

D. Retention and Graduation

1. To examine the attrition rate we looked at our students who enrolled in CLLS101 and tallied the numbers of students who left the program. If we could, we identified the reason. Since our last APR, we have had 100 students enroll in CLLS101. Twenty-five are no longer in a CLS program. The reasons are varied:

Reason	# of Students
Academic dismissal	5
Financial	1
Weather	2
Switched to Health Care Systems	1
Medical	2
Switched to Nursing	3
Switched to College of Arts and Sciences	1
Military call up	1
Switched to College of Technology	1
Switched to College of Education	1
Unknown reasons	7

2. Our current goals and strategies to retain students include:
    a. Intensive advising- students are required to meet with their advisor at least twice per academic year, students who are having difficulty are contacted by their advisor
    b. Progression review policy
        i. Grade of C or better in BIOL205
        ii. Grade of C or better in CHEM214
        iii. Grade of C or better in all CLLS courses

    We have analyzed grades in BIOL205 and CHEM214 and compared them to how well a student performs in the CLLS program. We concluded those students who did not receive a grade of C or better would not be successful in the program and internship.
3. It may be worth noting that many MLT students change their curriculum into MT program. Consequently, they do not graduate from the MLT program.
4. The number of students who enroll in the program and graduate in the prescribed period of time is nearly 100%. Most who take more than the "allotted" time transfer in from other programs or colleges and are missing professional course prerequisites, so it takes them longer to finish
5. After a student begins the professional sequence of the MT program they finish in 4 semesters plus 1 summer. MLT students in the professional sequence finish in 2 semesters plus 1 summer.

E. Access

1. The CLS programs make ourselves accessible to students by:
    a. Offering the phlebotomy certificate in Grand Rapids and in northern Michigan (beginning Fall 2005)
    b. Offering multiple entry points (summer and fall)
    c. Separating lecture and lab courses to allow flexibility in scheduling and to facilitate transfer students
    d. Adapting WebCT for our clinical internship and mixed delivery courses
    e. Adapting CLLS240, CLLS23, CLLS430, CLLS456 for mixed delivery using WebCT
    f. We are currently investigating the possibility of offering the MLT program in Grand Rapids and / or northern Michigan. A grant to fund program development was submitted to the Michigan Department of Labor and Economic Development.

2. The actions described in (1) above have had the following impact:
    a. Significantly increased the enrollment in the CLS programs, subsequently increasing the need for resources--supplies and costs and put added pressure on the department to find instructors for the courses. This has had no impact on the load of the tenure faculty because we have been at maximum load for 2-3 years.
    b. Summer and fall entry points allow a greater number of students the opportunity to enroll in the CLS programs, particularly students who are not accepted into the programs in pharmacy and optometry, but who have all of the necessary prerequisites for professional courses.
    c. Separating lecture and lab courses will allow flexibility in scheduling and eases the transfer of students into the program.
    d. Using WebCT for the clinical internship has reduced printing and postage costs, streamlined the paperwork, increases the speed at which students are graded, and facilitates communication between on-campus and off-campus faculty. However, the development has been time consuming for a faculty already on overload. It also assumes the clinical affiliate will have a computer that will allow a student to use the Internet. This has security implications for the laboratory, although all of our affiliates allow such access.

3. The action in (1) have had the following impact on the goals of the CLS programs
    a. Our number one goal is to increase enrollment. The introduction of the phlebotomy certificate in Grand Rapids and in northern Michigan will certainly increase student numbers. In addition, it is anticipated that the phlebotomy students will ladder into the MLT and/or MT program.
    b. The addition of a fall entry point allows students who have completed all of their Biology and Chemistry courses to enroll in the program
    c. We will implement the curriculum with separate lectures and lab courses in fall 2005 so we cannot comment on the impact to our goal.
    d. Developing WebCT for our internship has advanced our goals by allowing us to facilitate document delivery, communication and examination grading thus making the clinical experience more worthwhile for the student and ease some of the work load of the clinical faculty. The cost savings due to decreased copy cost and postage is also a plus.

F. Curriculum

1. Refer to the table below for a list of program related course using The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). Refer to appendix C for a detailed description of the each CLLS course.
    a. Refer to the table below for our directed electives. Note: we do not require students to enroll in specific Cultural Enrichment or Social Awareness electives. This allows the student to choose course in which they are most interested. list directed electives and directed General Education courses and provide rationale for these selections

Course	Phlebotomy Certificate	MLT Program	MT program	Rationale
MRIS102	X	X	X	Serves as foundation for medical terminology
CCHS101	X	X	X	CAHS core curriculum; information all consumers should know
CCHS102	X	X	X	CAHS core curriculum; information all health care workers should know; Contains content required by NAACLS
CCHS103		X	X	CAHS core; learn important skills not necessarily directly related to the lab
ENGL150		X	X	University requirement
ENGL250		X	X	University requirement
ENGL321			X	University requirement; important for those students continuing to a management position or graduate school; Contains content required by NAACLS
COMM221		X	X	University requirement; good foundation in working and communicating within workplace; Contains content required by NAACLS
MATH117		X	X	University requirement; Contains content required by NAACLS
BIOL108/286		X	X	Meets general education; required for CLLS235; Contains content required by NAACLS
BIOL205				Meets general education, Prerequisite for many CLLS courses, Contains content required by NAACLS
BIOL300			X	Meets general education, Prerequisite for many CLLS courses, Contains content required by NAACLS

Course	Phlebotomy Certificate	MLT Program	MT program	Rationale
CHEM114		X	X	Meets general education, Prerequisite for many CLLS courses, Contains content required by NAACLS
CHEM214		X	X	Meets general education, Prerequisite for many CLLS courses, Contains content required by NAACLS
CHEM324			X	Contains content required by NAACLS
EHSM315			X	Contains content required by NAACLS
HCSA335			X	Contains content required by NAACLS

b. There are no hidden prerequisite courses.

2. Yes, the curriculum has been revised recently. Briefly, we have separated lecture from lab for most of the CLLS courses, although we require concurrent enrollment. Additionally, we reduced the number of biology credits and removed a management course. This has allowed us to reduce the total number of credits required to graduate. Please refer to the attached curriculum check sheets for more detail.
3. We are in the process of implementing the most recent curriculum changes.
4. We examine our curriculum in depth every 3-5 years and compare it to the NAACLS essentials. In this way we ensure we are covering current and relevant material to maintain accreditation, which is necessary for the graduates to successfully complete a national certification exam.

The following NAACLS check-sheet lists the FSU courses meeting the NAACLS Standard. Where appropriate, clarifying comments are included in bold italics. For reference, the FSU course catalog descriptions are included on the following pages (see Section 3.F.III.3). Appendix 6

Standard	**Medical Technology**	**Medical Laboratory Technician**
Standard 9B1		
Anatomy/physiology	***BIOL 205***	***BIOL 205***
Immunology	***CLLS 251***	***CLLS 251***
Genetics/molecular biology	***BIOL 103***	
Microbiology	***BIOL 108 or BIOL 286***	***BIOL 108***
Organic/biochemistry	***CHEM 214, CHEM 324,***	***CHEM 214***
Statistics	***MATH 117, EHSM 315***	***MATH 117***
Standard 9B2		
Pre-analytical, analytical and post-analytical components of laboratory science		
Hematology	***CLLS 230, CLLS 430, CLLS456***	***CLLS 230, CLLS256***
Hemostasis	***CLLS 224, CLLS456***	***CLLS 224, CLLS256***
Chemistry	***CLLS 215, CLLS 355, CLLS456***	***CLLS 215, CLLS256***
Microbiology	***BIOL 108 or BIOL 286, CLLS 235, CLLS 240, CLLS 435, CLLS456***	***BIOL 108, CLLS 235, CLLS256***
Urinalysis	***CLLS 224, CLLS456***	***CLLS 224, CLLS256***
Microscopy	***CLLS 224, CLLS 230, CLLS 235, CLLS 430, CLLS 435***	***CLLS 224, CLLS 230, CLLS 235, CLLS256***
Molecular diagnostics	***Introduced in CLLS 355, but needs enhancement***	
Immunology	***CLLS 251***	***CLLS 251, CLLS256***
Immunohematology	***CLLS 228, CLLS456, CLLS 459***	***CLLS 228, CLLS256***

Standard 9B3		
Principles and practices of quality assurance/quality improvement as applied to the pre-analytical components of laboratory services.	***Integral part of clinical laboratory sciences: CLLS 215, CLLS 224, CLLS 228, CLLS 230, CLLS 235, CLLS 240, CLLS 251,CLLS 355, CLLS 430, CLLS 435, CLLS 456, CLLS 459, CLLS 465***	***CLLS 215, CLLS 224, CLLS 228, CLLS 230, CLLS 235, CLLS 240, CLLS 251, CLLS256***
Principles and practices of quality assurance/quality improvement as applied to the analytical components of laboratory services.		
Principles and practices of quality assurance/quality improvement as applied to the post-analytical components of laboratory services.		
Standard 9B4		
Application of safety to laboratory practice.	***Introduction to topic in CCHS 102; safe handling of patient specimens and general safety in the clinical laboratory is described and practiced in all CLLS courses.***	***Introduction to topic in CCHS 102; safe handling of patient specimens and general safety in the clinical laboratory is described and practiced in all CLLS courses.***
Application of governmental regulations and standards as applied to laboratory practice.	***CCHS 102,CLLS 456, CLLS 465, CLLS 491***	***CCHS102, CLLS 256, CLLS 291***
Standard 9B5		
Principles of interpersonal and interdisciplinary communication and teambuilding skills.	***COMM 221, CLLS 465***	***COMM 221***
Standard 9B6		
Principles and applications of ethics.	***CLLS 101***	***CLLS 101***
Principles and application of professionalism to address ongoing professional career development.	***CLLS 101, CLLS 465, CLLS 499***	***CLLS 101, CLLS256***
Standard 9B7		
Education techniques and terminology sufficient to train/educate users and providers of laboratory services.	***CLLS 465, HCSA 335***	

Standard 9B8		
Knowledge of research design/practice sufficient to evaluate published studies as an informed consumer.	***CLLS 499***	
Standard 9B9		
Critical pathways and clinical decision making.	***Algorithmic thinking/clinical problem solving is introduced/reinforced in every CLLS course, and culminates with special emphasis in CLLS 456; CLLS 491***	***Algorithmic thinking/clinical problem solving is introduced/reinforced in every CLLS course, and culminates with special emphasis in CLLS 256; CLLS 291***
Performance improvement.	***CLLS 465, CLLS 491***	***CLLS 265, CLLS 291***
Dynamics of healthcare delivery systems as they affect laboratory service.	***CLLS 465***	
Human resource management to include position description, performance evaluation, utilization of personnel, and analysis of workflow and staffing patterns.	***CLLS 465, HCSA 335***	
Financial management: profit and loss, cost/benefit, reimbursement requirements, materials/inventory management.	***CLLS 465***	

G. Quality of Instruction

1. Discussion of student and alumni perceptions: refer to section 2.

2. Discussion of advisory committee and employer perceptions: refer to section 2.

3. The CLS programs continue to improve the quality of our education by adding updated instrumentation. The major improvement is the addition of a laboratory information system. This allows the students to get experience in ordering tests, generating barcode labels, printing work logs, and uploading and downloading data through instrument interfaces. We have also added several new pieces of laboratory equipment since the last program review: Microscan Walkaway 40, BacT Alert 120, CellDyn 3500, electronic differential counts, and urine dipstick readers, among other things.
We have successfully enhanced our lectures with WebCT. For example, we use it as a mechanism to continue to have discussions outside of the classroom, deliver of review material, quizzing, and maintain a secure grade book.

We have also improved the curriculum by creating a course in phlebotomy. This has allowed us to remove that content from the existing courses leaving more room for more appropriate content.

4. Professional Development by the Faculty: The faculty have attended a variety of Faculty Center for Teaching and Learning (FCTL) courses, including WebCT help courses and most recently "Macromedia Flash Workshop." Barbara Ross finished her MS degree in Health Systems Management. For more detail see faculty CVs in the appendix
5. Efforts to increase interaction between students with faculty include a yearly trip to the MSCLS meeting and monthly trips to Mt. Pleasant to attend the Central Michigan Association of Medical Technology meeting. These are good opportunities for faculty and students to earn continuing education credit and to interact outside the classroom in a professional setting.
6. Current laboratory practice has always infused teaching and learning in the CLS courses and this has not changed. As instructional technology has improved faculty have quickly adapted to innovative teaching methods. The CLLS courses incorporate a variety of reading, writing, research, and lab assignments to accommodate various learning styles.
7. Having been successful at CLS for the past 45 years, we will continue to adapt course content and deliver them as circumstances require. We interact with all of students for many hours per week. Consequently, we have a good idea of their learning styles and can identify those students who may require an extra effort on our part to help them succeed. The quality of instruction has adequately prepared students for entry level employment as seen by a 100% employment rate one year after graduation.

H. Composition and Quality of Faculty

1. Tenured Faculty
   a. Daniel P deRegnier, MS, MT(ASCP), Associate Professor, Clinical Coordinator

      Barbara Ross, MS, MT (ASCP), Assistant Professor, Program Coordinator

   b. Daniel deRegnier received a merit award in 2002, Barbara Ross in 2000
   c. Refer to appendix for current CVs and summaries of professional activities.
2. Workload
   a. The normal workload in the program is 18 contact hours/week, or an annualized workload of 36 contact hours. The faculty in the program accepts overload nearly every semester. This is in line with the college wide policy of workload.
   b. The program coordinator receives 25% release time for coordinator related duties.
3. Recruitment
   a. Faculty members are recruited using the procedure approved by the university. Once the approval to hire faculty has been obtained, a search committee will be formed. The committee will be chaired by a faculty member within the program and will have representation from the program faculty, faculty within the department and at least one member from outside the department. A national search will occur with advertising placed in the chronicle of higher education on HigherEducationJobs.com and in appropriate professional publications. After review of applications, telephone interviews will be conducted and qualified applicants invited to campus for an interview. During the interview process, the applicants will meet with program faculty, administration and will be required to make a 50 minute long presentation.
   b. New faculty are required to possess at least a Master's Degree, preferably in Clinical Laboratory Sciences, be a certified Medical Technologist, and have teaching experience.
   c. The program has no set goals for hiring new faculty members of a particular race, gender or ethnicity other than to hire University guidelines

4. Orientation of new faculty.
   a. We would expect a new faculty member to take advantage of the FCTL's New Faculty Transition Program. A current CLS faculty would be assigned to mentor the new faculty.

5. Reward Structure
   a. In addition to salary, the faculty is rewarded with departmental and college funds to offset travel to professional meetings. There are no eligibility criteria, although faculty are required to apply through the Faculty Affairs Committee. The reward is limited to $500/faculty member per year. Faculty members are expected to apply for Timme funding, as well. Departmental incentive funds have been available on a limited basis to offset the cost of travel for professional development. Money for software or reference materials is made available from incentive funds earned through off campus teaching efforts.
   b. The current salary structure sometimes makes it difficult to attract faculty, especially adjunct faculty. The current pay scale for adjuncts was developed in 1994 so it is hard to recruit quality faculty to travel to Big Rapids.
   c. The reward structure to support faculty productivity in teaching is in place. Faculty who accept overloads are compensated according to the university standard. However, since faculty routinely accept overload each semester, research is curtailed. Both faculty members in the program participate in several college and university committees. There is no program in place to reward faculty to actively participate in research and service. Additional faculty would address this issue. There is no reward structure in place for enhancing diversity and inclusion. These have not been an issue due to the inability to hire additional faculty.

6. Graduate instruction
   a. There are no graduate courses in the CLS programs.

7. Non-Tenure-Track and Adjunct Faculty
   a. There are no full-time non-tenure track instructors

   b. See (7a) above.
   c. An adjunct instructor in the CLS program should be a certified medical technologist (MT), preferably with a Masters degree.
   d. The problem with using only adjunct faculty, in our opinion is the lack of consistency and the difficulty finding qualified instructors who are willing to relocate, or at least travel, to Big Rapids. There is a limited pool of qualified candidates, so we are left with using adjuncts who may have limited knowledge of the topic and no teaching experience. This has the potential to affect the quality of the student's education.
8. Our accrediting agency, National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) has no opinion on the hiring of adjunct faculty other than "Faculty designated by the program must demonstrate adequate knowledge and proficiency in their content areas and demonstrate the ability to teach effectively at the appropriate level."

I. Service to Non-Majors

a. There are no CLS courses that are designated as General Education service courses

b. Non-General Education service courses: Not applicable.

c. Impact of the provisions of General Education/non-General Education courses: Not applicable

d. Discussions have been held with faculty in the Forensics tract of the Applied Biology program regarding forensic student enrollment in the clinical chemistry courses.

J. Degree Cost and Productivity Data

Productivity Report Aggregated by Course Prefix (CLLS)

Year	Student Credit Hours (SCH)				Full-Time Equated Faculty (FTEF)				SCH/FTEF			
	Summer	Fall	Winter	F + W	Summer	Fall	Winter	F + W	Summer	Fall	Winter	F + W
1999-00	297.00	510.00	408.00	918.00	2.76	4.01	4.00	4.00	107.61	127.28	102.00	229.30
2000-01	201.00	210.00	327.00	537.00	2.50	3.00	3.00	3.00	80.49	70.00	109.00	179.00
2001-02	231.00	190.00	306.00	496.00	2.65	3.00	3.00	3.00	87.17	63.33	102.00	165.33
2002-03	200.00	284.00	268.00	552.00	1.45	2.90	2.61	2.75	137.93	97.93	102.68	200.36
2003-04	93.00	289.00	406.00	695.00	0.93	2.33	2.65	2.49	100.00	124.03	153.21	279.12

When ranked by SCH/FTEF (aggregated by course prefix) we are 112th (out of 140)
We can get to the median, but not much lower than that. Our current enrollment has increased but those numbers won't show up for a couple of years.

Degree Program Costing 2001-2002

	Avg. Instructor Cost/SCH	Avg. Dept Cost/SCH	Avg. Dean's Cost/SCH	Total Avg. Cost/SCH	Total Program Instructor Cost	Total Program Dept. Cost	Total Program Dean's Cost	Total Program Cost
FSU	153.93	34.70	17.08	205.71	N/A	N/A	N/A	N/A
CAHS	165.66	47.56	22.53	235.75	N/A	N/A	N/A	N/A
HRP	171.05	37.64	24.36	233.97	N/A	N/A	N/A	N/A
MT	192.70	36.48	22.94	252.13	26,785.66	5,071.11	3,189.08	35,045.86
MT – 2002-2003	180.05	62.62	21.62	263.82	25,026.58	8,639.53	3,005.05	36,671.16
MLT	237.21	36.16	24.06	297.43	18,739.54	2,857.00	1,900.43	23,496.97
MLT – 2002-2003	293.06	66.96	22.51	382.52	23,151.44	5,289.88	1,777.92	30,219.24

N/A – not applicable

See appendix E for detail on Degree Program costing. A reason for the relatively high costs of the MT and MLT programs is related to our equipment intensive laboratories. We maintain one of the best-equipped labs of any MT/MLT program in the nation. Consequently, our students are very well prepared as they enter their clinical internship. Educating health professionals is expensive.

K. Assessment and Evaluation

1. About 10 years ago, the program developed a plan for program assessment. This included tracking surveys of graduates, surveys of employers of graduates, graduate scores on national certification examinations, suggestions from the program Advisory Committee. This assessment process was approved by the Department Head at the time, and by the Department Head to which we were assigned after she retired.

These variables were chosen because some of them are a required part of program assessment for external accreditation (specifically certification examination scores). At the 2001 meeting of Clinical Laboratory Science Educators in Chicago, a consensus was reached that employer satisfaction, certification examination scores, and graduate satisfaction survey results were the most useful measures of program success. The CLS program at Ferris State University was already using these measures as program assessment tools.

As our enrollment decreased, we tried to trace why students left the program without finishing. Other than academic difficulties, we have found no clear trends as to why students fail to complete the program. It is difficult to maintain statistics on program leavers, because so many of our students don't enter the university declaring a CLS major. In addition, MLT students change to the MT program, while MT students change to the MLT program for reasons of their own. We can easily accommodate these students as their plans change, and are happy to do so.

2. Surveys of graduates and their employers are discussed in another section of this document, and it is unnecessary to repeat the assessment here. There are essentially no trends in survey results from these two groups, because they have been very positive throughout the history of the program.

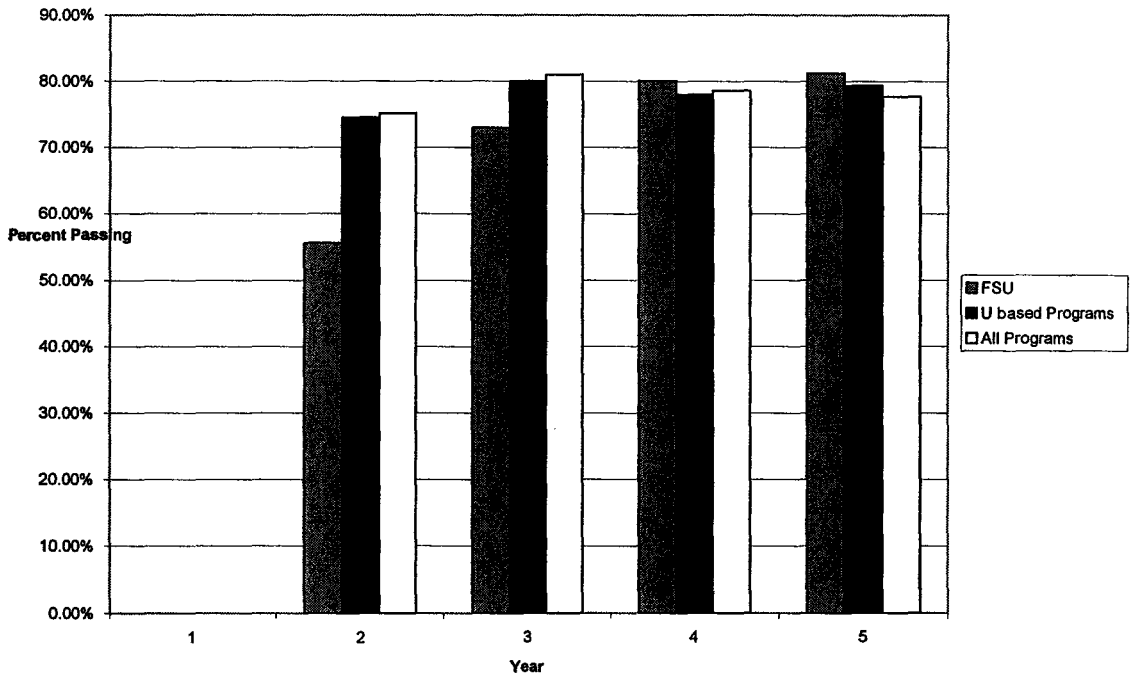
Certification scores over the years have largely reflected the national mean scores. For the purposes of this document, only data for the certification examination administered by the American Society for Clinical Pathology are included. An alternate examination is administered by the National Credentialing Agency for Medical Laboratory Personnel. Although information about applying for this examination is also provided to program seniors, very few of them take the examination (two or fewer graduates per year). For the Medical Technology program, national means are provided for both university based programs and all programs, including the traditional hospital – based, apprenticeship model programs. These scores are for first time examinees.

Certification Examination Scores, MT Classes of 2001 – 2004

Data are included here for the MT classes of 2001 – 2004. Previous classes were assessed in earlier APR documents. The class of 2005 is taking the examination while this document is being written, so complete data are not yet available. Results from those graduates who have taken the examination to date are encouraging.

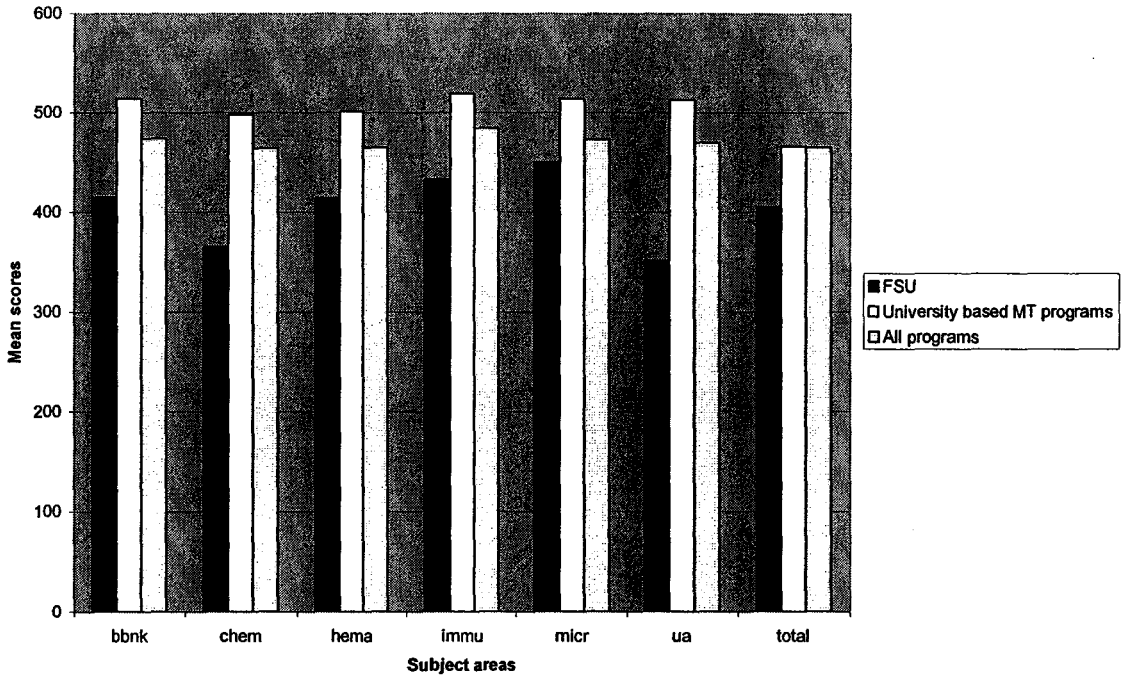
Perhaps the most important information is the percentage of graduates who pass the examination on their first attempt. Despite the loss of half the program faculty during this period, the percentage of first time pass rates from the Ferris State University program has increased every year. This reflects the academic preparation and hard work of the students, but the program is proud to have kept the academic content of the program strong enough to allow graduates to succeed.

Comparison of Pass Rates for National Certification Examination



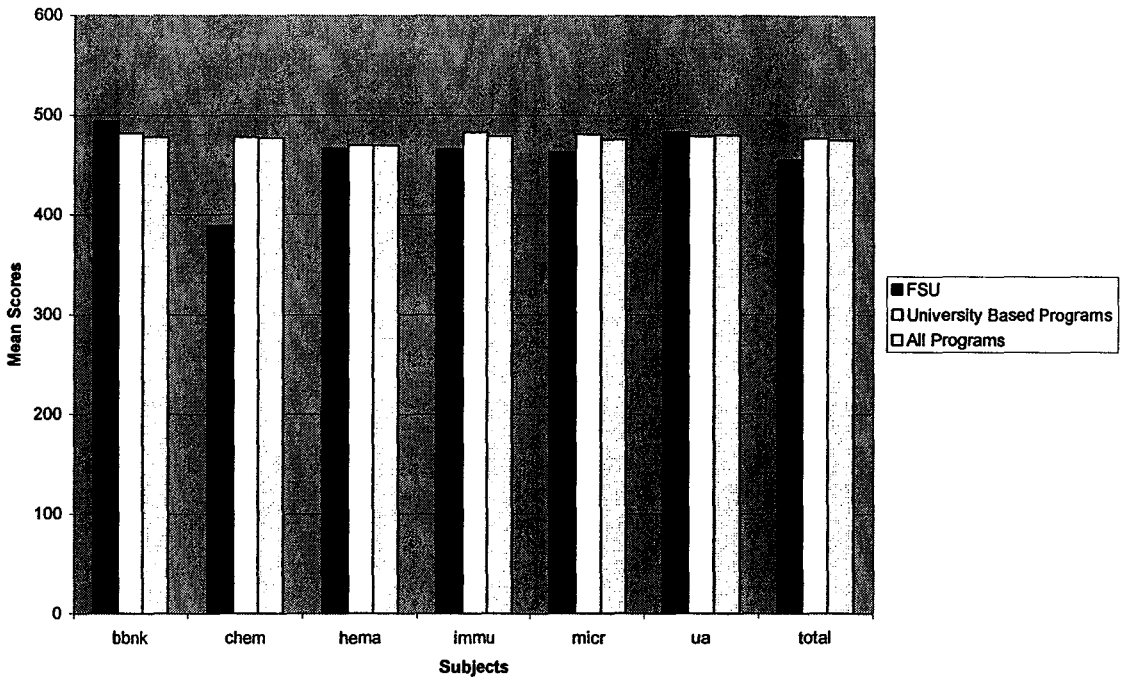
The class of 2001 generally had disappointing scores on the certification examination, ranking below national averages in every category. This class was not especially strong academically, which contributed to their low scores. The program responded by revising the grading format for the on – campus simulated laboratory course, to increase the percentage of the grade that is based on examinations.

Comparison of Certification Exam Scores, MT Class of 2001



Note that scores in clinical chemistry were low for 2002 graduates of the FSU MT program, while other scores improved. This was the first class that graduated after the faculty position that was responsible for clinical chemistry was eliminated, and the remaining faculty were scrambling to update our own knowledge of the subject to try to teach it to students. Each of the remaining three faculty took part of the content of clinical chemistry 1, while the blood bank instructor assumed responsibility for Clinical Chemistry 2.

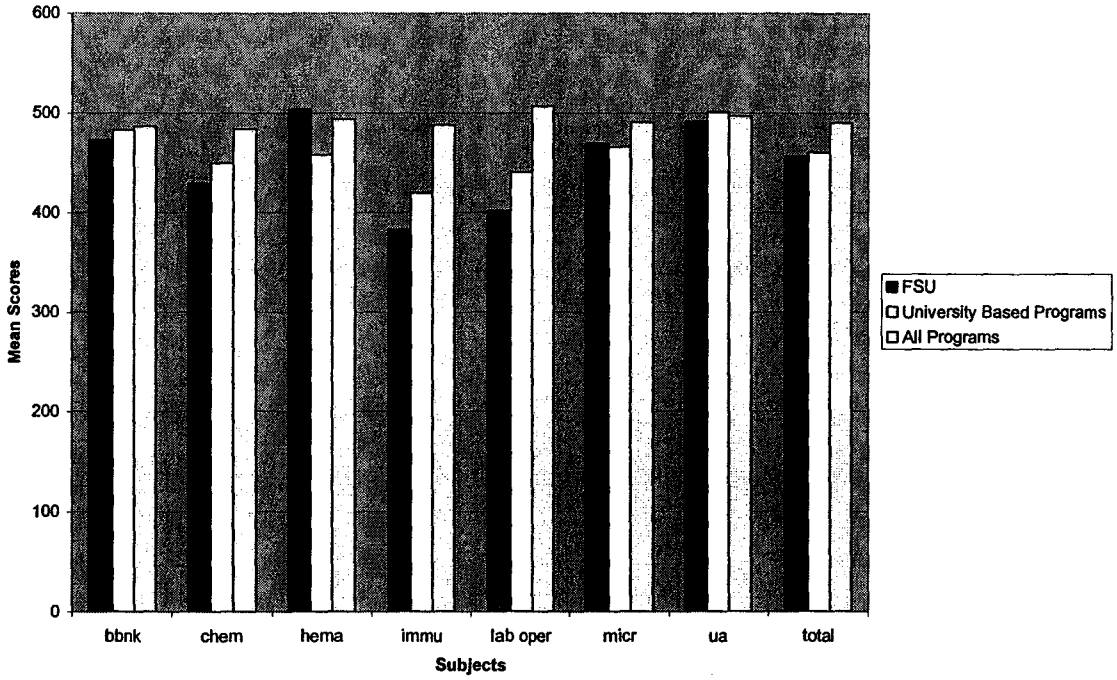
Comparison of Certification Exam Scores, MT Class of 2002



By the time the class of 2003 was examined, scores for chemistry had improved somewhat, although they remained below the national mean. Meanwhile, scores in blood bank had fallen, possibly reflecting the faculty member's increased emphasis on updating clinical chemistry knowledge, while somewhat neglecting developments in the blood bank area. Both blood banking and clinical chemistry require an understanding of immunology, another weak point of this class. CLLS 251, Clinical Immunology, was redesigned to attempt to improve these scores.

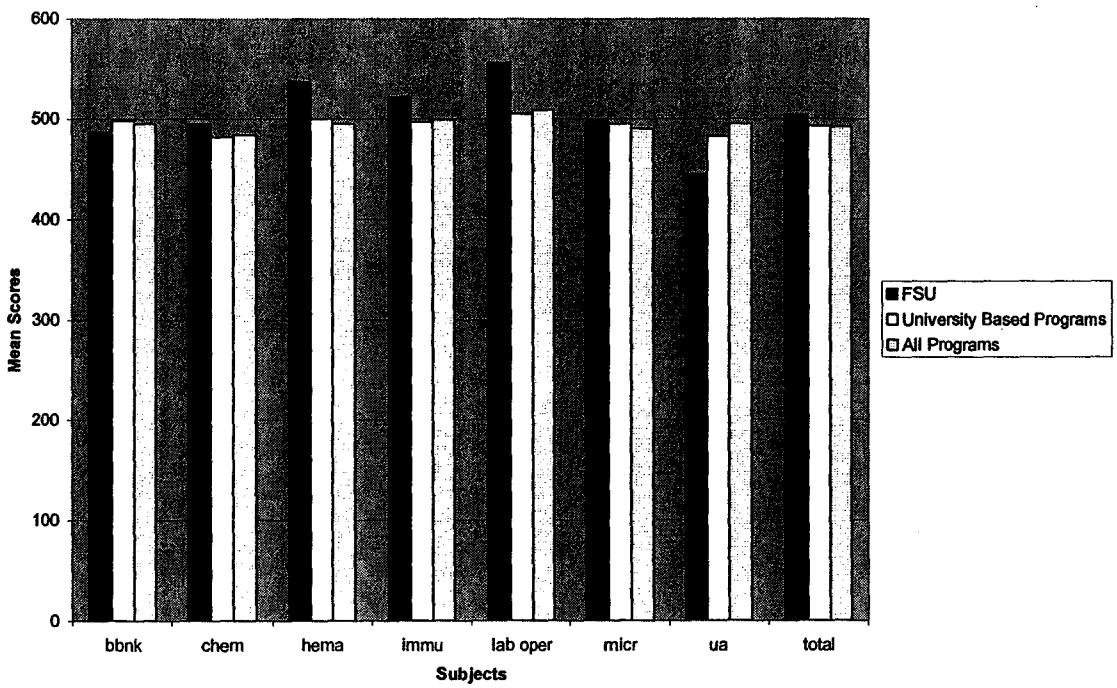
Another point that can be made about 2003 scores is that another category of questions was added to the exam: Laboratory Operations, which covers laboratory mathematics, laboratory safety, patient safety issues, quality control, management, and education. As a response to this development, more laboratory mathematics assignments were added to Clinical Chemistry 1, and more assignments dealing with safety and regulatory issues were added to CLLS 465, the laboratory management course.

Comparison of Certification Exam Scores, MT Class of 2003



By contrast, the MT class of 2004 did very well on nearly every section of the national certification examination. This class was extremely strong academically (about half came from the FSU Honors College) so program faculty are reluctant to claim credit for their strong performance.

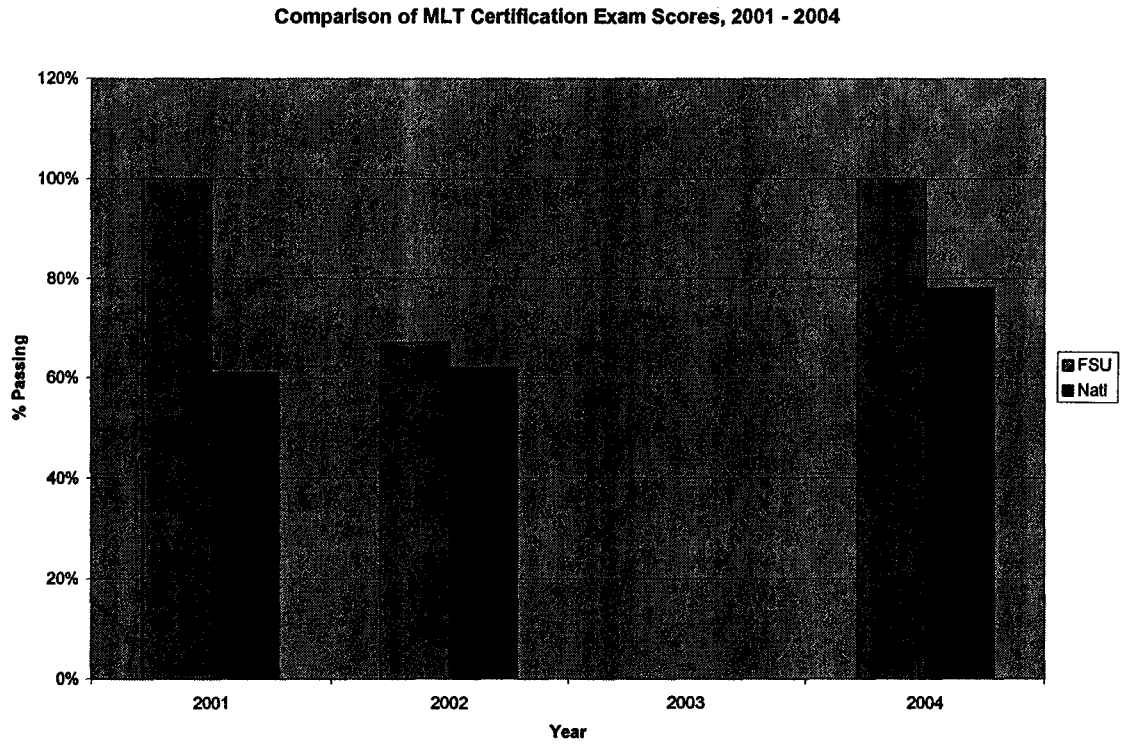
Comparison of Certification Exam Scores, MT Class of 2004



Certification Examination Scores, MLT Classes of 2001 – 2004

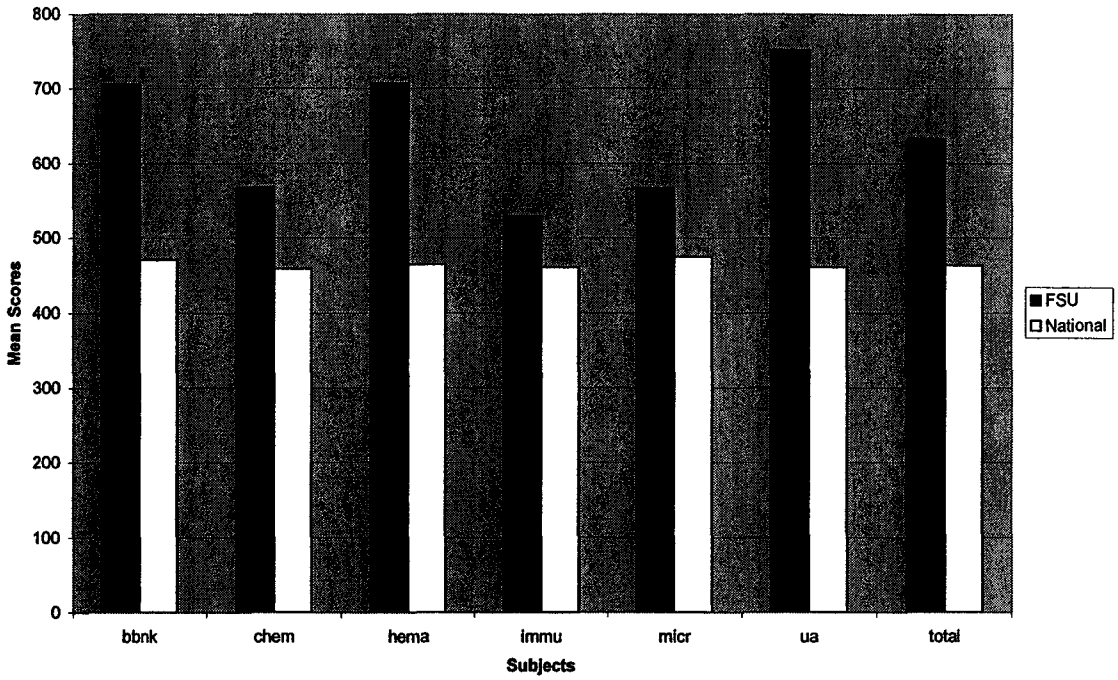
Data for the MLT program are more difficult to come by, because of the low numbers of graduates in recent years. However, FSU graduates have consistently scored higher than the national mean scores. Note: MLT scores are reported without being divided into university – based and hospital – based programs because the overwhelming majority of programs are based in universities or community colleges.

Ferris State University MLT students take the same introductory courses in blood banking, clinical chemistry, hematology, immunology, microbiology, and body fluid analysis as the MT students. By requiring rigorous preparation for these students, they learn and retain knowledge that they can apply on the job, as well as to certification examinations.



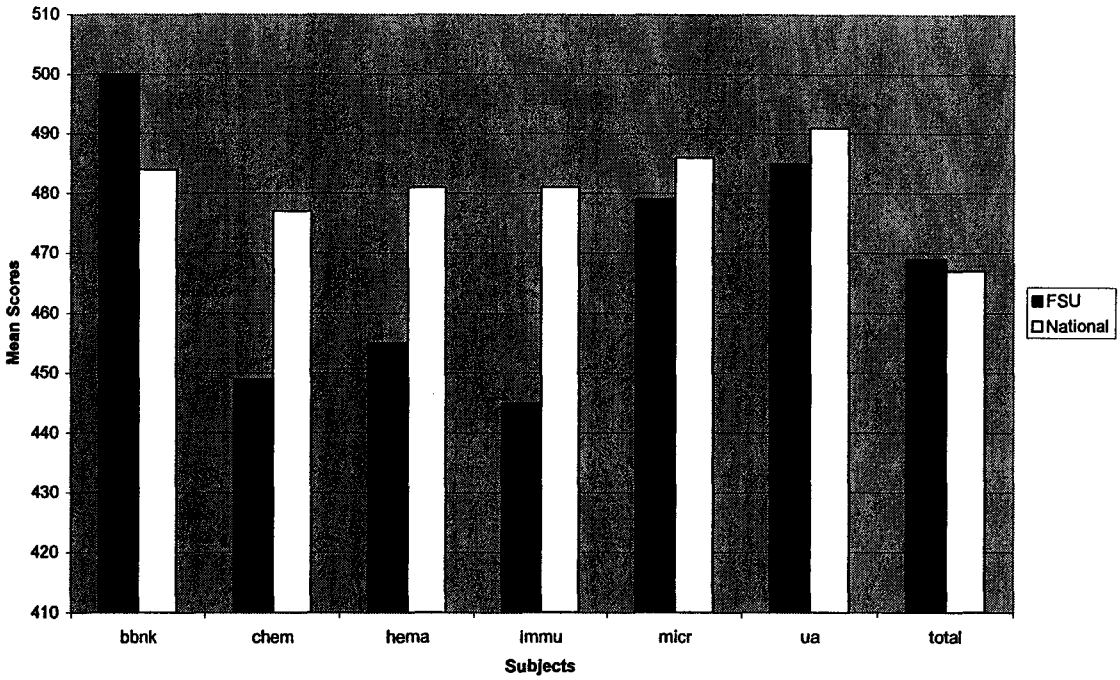
Ferris State University scores for 2001 reflect the performance of only 1 graduate. In 1999, nobody enrolled at Ferris State University to begin the MLT program. This student began in the MT program. Due to personal circumstances, she decided not to commit to four years of college. She was happy to learn that she could transfer to the MLT program and graduate with an Associates Degree in two years. She is now working as an MLT, and planning to finish the MT program when circumstances permit.

Comparison of Certification Exam Scores, MLT 2001



The class of 2002 again reflects faculty turmoil in its performance- scores in clinical chemistry and immunology were especially low for this group. Although enrollment and graduation numbers had improved, their performance did not reflect the typical high scores of FSU graduates.

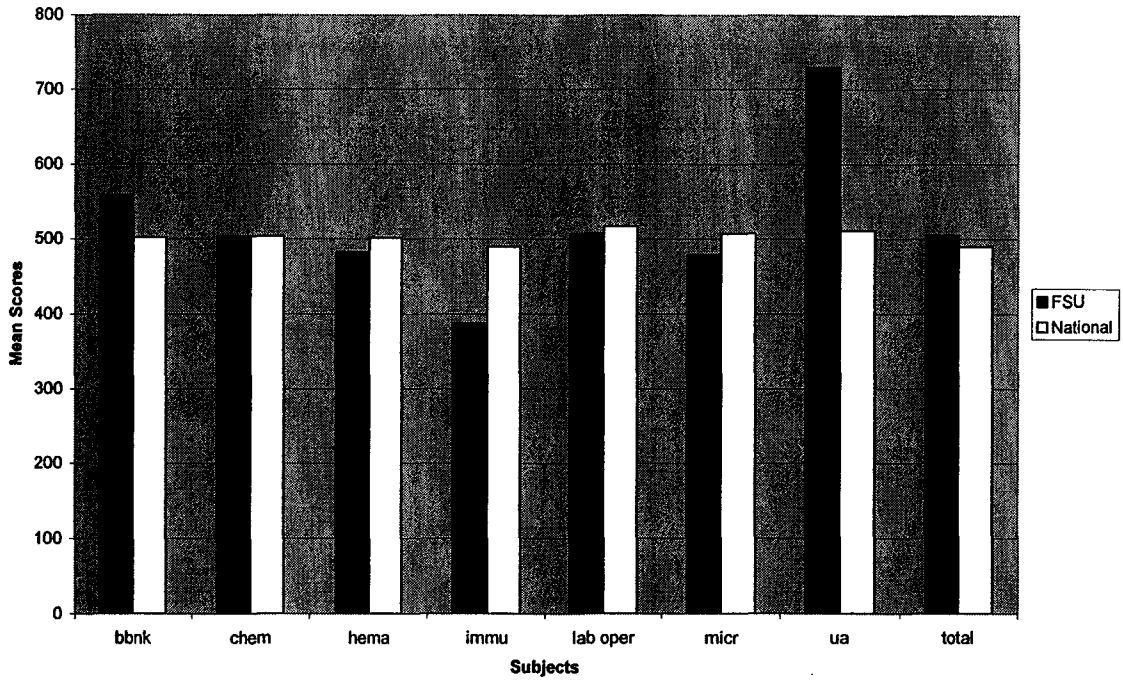
Comparison of Certification Scores, MLT 2002



As if the low scores for FSU MLTs in 2002 were not bad enough news, there are NO scores at all for the class of 2003. Again, only one student completed the clinical internship that normally ends the program. Unfortunately, she did NOT successfully complete the cultural enrichment course that is required of AAS students, and thus has not graduated from the program. Under pressure from her employer, she is planning to complete the program in Fall 2005 so that she will be eligible for certification.

Four students completed the MLT program in 2004, and their scores again reflect the performance that we expect of MLT graduates. Scores for 2005 graduates are not yet available.

Comparison of Certification Scores, MLT 2004



3. We have found over the course of many years that graduates and their employers provide valuable input into what needs to be stressed in the curriculum. Employers, for example, ask for more knowledge of quality assurance, quality control, and regulatory requirements, so we have added these topics to CLS courses. Because even AAS degree students need some introductory knowledge of statistics, we have recommended that students take MATH 117, rather than MATH 115.

Although we lose students due to academic difficulties with the biology and chemistry courses that we require, we continue to require microbiology and anatomy and physiology for both AAS and BS degree students. In addition, the baccalaureate students need to complete general biology and pathophysiology. Both groups of students complete CHEM 114 and 214; BS degree students complete CHEM 324 as well. These science courses provide the breadth of knowledge needed to succeed as students enroll in courses with the CLLS prefix, where they learn not only to measure analytes in blood and body fluids, but to relate the test results to the patient's physiology. The courses required in the curriculum enable students to succeed in the program without causing undue academic difficulty.

4. Again, feedback from graduates and their employers provides valuable information about what to include in CLLS courses and what requires more emphasis in the curriculum. We believe that we have the appropriate prerequisite biology and chemistry courses that can enable students to succeed in the CLS program and on the job. Our progression policy, which requires that students earn at least a C in BIOL 205, CHEM 214, and courses with the CLLS prefix, ensures that students who are not prepared to function in the fast paced and stressful conditions in most clinical laboratories are not assigned to a clinical internship until they meet those requirements.

Because of the courses required for the AAS degree, our graduates can easily ladder into the BS degree program without having to return for prerequisite courses. Most AAS degree graduates can complete the BS degree program in less than two additional years.

Based on the assessment tools of employer feedback, graduate feedback, and certification examination scores, we are able to maintain an up – to – date curriculum that prepares our graduates to succeed in the clinical laboratory profession.

Assessment and Evaluation

Activity	When completed	What is Done	Follow-up
Simulated Lab Performance	Fall and winter semester	Competency evaluation, exams	Monitor student progress on internship
Graduation rate	Annual	Monitor	
Survey graduates	1 year post degree	Surveys circulated to faculty	Annual assessment meeting
Survey employers	1 year post degree	Surveys circulated to faculty	Annual assessment meeting
Clinical faculty evaluate student's preparation	At the end of clinical experience	Surveys circulated to faculty	Annual assessment meeting
Students evaluate clinical experience	At end of each clinical rotation	Surveys circulated to faculty	Annual assessment meeting
Certification exam evaluation	ASCP – 4 x per year NCA – 2 x per year	Scores and analysis circulated to faculty	Annual assessment meeting
Career services survey	3 months post degree	Surveys circulated to faculty	Annual assessment meeting
Adjunct instructor meeting	Annual	Discussions	Annual assessment meeting
Advisory committee meeting	Annual	Discussions	Annual assessment meeting
Monitor program attrition (leavers)	On-going	Surveys circulated to faculty	Annual assessment meeting

L. Administration Effectiveness

1. Adequacy of administrative and clerical support.

   The CAHS transferred the MT and MLT programs to the Health Management Department in 2003. Since that time, we have been extremely happy with the support we have received from our department head, Ellen Haneline. We share a secretary with 4 other programs, but she is efficient enough to handle all our program needs. The secretarial support, including work-study students, in our Student Affairs office is adequate to meet the needs of the programs. The counselor and recruiter are very sensitive to our enrollment issues and work with us to increase our enrollment.

   Because of limited faculty availability, students attend class until late afternoon or evening and have to return the next day at 8:00.

   The administration has been instrumental in the development of the off-campus programs through grant writing and membership in the regional skills alliance groups.

2. Efficiency of the program/department

   The program coordinator, Barbara Ross, is very efficient. She holds regular program meetings and has great communication with the other faculty member and the department head. Concerns are addressed in a timely manner. The current department head does an outstanding job that we feel like we finally have an advocate for the programs.

3. Class and teaching schedule preparation

   Our department head prepares the class schedule with input from the faculty. This process works well for us.

4. Students ability to take courses in a timely manner

   For the most part students are able to complete the MT program in 9 semesters (including one summer session) unless they choose to take longer. Students in the MLT program can finish the program in 5 semesters (including one summer session) unless they choose to take longer. The CLLS courses are offered in a preset scheduled so the students are assured that they will be able to graduate on time. The phlebotomy certificate can be completed in one semester plus a 4-week (160 hours) internship. The internship may pose a problem if they are also a full-time student. The student is expected to report to the affiliated lab 8 hours/day, 5 days/week for 4 weeks. This may keep them from enrolling as a full-time student.

Section 4: Facilities and Equipment

Section 4: Facilities and Equipment

A. Instructional Environment

1. Since the previous APR the CLS laboratories were moved from first floor up to the fourth. This move gave us more space for our instrumentation and allows us to offer larger laboratory sections. Currently, the on-campus classrooms the CLS use are adequate and have, or soon will be, updated. Almost all classrooms are equipped with Proxima-style projection units and computers. These units make it much easier to deliver course material. There is one classroom with tables rather than desks, which are fine, except the tables are very narrow and unstable. In addition, our labs are adequate at this time. We are waiting for some minor renovations to be completed. An area of improvement would be to bring more technology into the labs in the form of Proxima-style projection units. These would be useful for projecting teaching materials and images from the teaching microscope.

Our main concern right now is the HVAC system in the building is completely inadequate, especially in the summer. One room, VFS423, is especially warm all year long. The AC regularly fails allowing the temperature to increase dramatically. The temperature fluctuations damage the sensitive equipment. Work currently is in progress to address the problems.

The off-campus classrooms and labs for the phlebotomy program are, currently, adequate for our needs.

2. Currently, all classrooms, but one as noted above, are in good condition and have no negative impact on teaching.

3. Our current needs can be addressed by the installation of Proxima-style units in our labs. Additionally, as the Big Rapids enrollment increases we will encounter serious limits on our laboratories. For example, VFS421 is schedule this fall to be in use from 8:00 – 9:00 pm Monday and Wednesday, 8:00 am –10:00 Thursday and 8:00 – 6:00 pm Tuesday and Thursday.

4. A request for a minor capital improvement has been submitted. The request contains plans to upgrade the cabinetry in the laboratories, paint walls, remove ventilation hoods and install flammable liquid storage cabinets. Approval is pending the decision of the president.

5. The proposed changes will enhance our program delivery by enabling the faculty to project images relevant to the practice of clinical laboratory sciences. Cosmetic improvements may help with recruitment and improve overall organization of the lab.

B. Computer Access and Availability

1. There are 6 computers available for students in our labs. The main role of these computers is to provide access to our Laboratory Information System (LIS), although students are able to check email or access course materials. In order for the LIS to function in its full capacity it requires periodic upgrades and version changes. This is accomplished through an annual maintenance agreement with the vendor. Currently, we do not have the annual maintenance agreement. The CAHS also has a student-computing lab that is available during the fall and winter semester.

2. The main role of the computers in the CLS labs is to provide access to our LIS although students are able to check email, CLS educational tutorials or access other

course materials. In addition, since the CAHS computer lab has limited hours of operation, the students may use our computers for research purposes. The reduction in CAHS computer lab hours has been an inconvenience to some of our students, particularly those who commute. They like to have access to the CAHS computer lab to do homework or work on projects between classes or when our teaching labs are closed.

3. We believe the numbers of computers in the CAHS is adequate, although care needs to be taken to make sure they are scheduled for regular updating plan that includes hardware and software, which we understand they are, at least at this time. The limited hours of the CAHS computer lab may be a hardship for some students, but we are able to direct them to FLITE if they require additional computing time. Allocating more money for student employees may alleviate limiting the CAHS computer lab hours. We understand that this decision is not made in CAHS, but believe reduced hours may become an issue as enrollment in CAHS continues to increase.

4. Currently there is no written plan to upgrade the computers in VFS421 and 423. We do however; get "hand-me-down" computers that are taken out of service due to an upgrade. If the old computer is newer than one of our lab computers, then we are upgraded. We anticipate including this in our strategic plan for next year and will earmark any future incentive funds for purchase of the computers.

5. We use WebCT for our internship courses. It is an efficient way to communicate, deliver documents, administer quizzes, and grade the student while they are off campus. Our clinical affiliates are very happy with the system. We also use WebCT to enhance many of our courses. For example, we will post lecture notes, host discussions or give review materials. Most students seem comfortable with using WebCT and have come to rely on it for lecture materials.

6. We have been frustrated in the past with the level of computer support we have received. The turnover of personnel and policy changes since the last APR has made it difficult to know how to report problems and to whom. The current computer technicians seem to have a handle on the needs of the faculty.

Support for WebCT is spotty at best. We appreciate that the FCTL have increased the number of WebCT training support, but many courses that are offered are scheduled at times that are inconvenient because of our in-class teaching load. It would be helpful if there was a WebCT specialist in the CAHS to whom we could turn to for help.

C. Other Instructional Technology

1. Our LIS is used in the instruction of the MT and MLT students. It is an integral part of a real laboratory and we use our LIS extensively heavily during the fall and winter semesters to teach students how an LIS operates and give them hands on experience. We believe we are one of only a handful programs, nationwide, who have this resource.

   The Clinical laboratory is a technology intensive area of health care. The entire program at Ferris involves instructing students in the use of technology that is found in the health care setting. Consequently, the analyzers that our students are trained on are also considered "instructional technology" along with the software that operates them.

2. See number 1

3. The LIS we own is more than adequate for what we do with it; however, we need to maintain support or it goes out of date quickly. The only way to do that is by purchasing an annual maintenance contract. It is not currently in the budget. Since the analyzers are such an integral part of the student's education and are considered instructional technology, it is important that they are also kept in good working order. This is best accomplished with annual maintenance agreements. Currently, we have maintenance contracts on only two of the analyzers. Increased funding to purchase contracts on the others would be ideal and be very beneficial to the students. Again, we could earmark any future incentive funds for maintenance agreements.

4. There is no written plan that includes purchasing the maintenance agreement for the LIS on an annual basis. In our opinion, there should be.

5. Thanks to the generous donations from laboratories and alumni we have one of the best-equipped student labs in the country. They not only donate equipment, supplies and reagents, they also contribute their time and expertise. For example, honorary doctorate and alumnus of the year, Robyn Myers, (MT'83), spends one day per year with the CLS students and faculty. She conducts a laboratory exercise for the students and performs maintenance and in-services on the analyzer she donated.

D. Library Resources

1. The print and electronic resources available through FLITE are adequate for our program.

2. The service and instruction that is provided by FLITE faculty and staff meet the needs of the program. The allied health liaison has provided excellent support for the program.

3. The budget allocation provided by FLITE to our program seems to be adequate. The liaison keeps in contact and informs us of any purchases that are pending. We are allowed to have input into some of the selections that are added to the collection.

Section 5: Conclusions

Section 5 Conclusions

A. Relationship to FSU Mission

"Ferris State University will be a national leader in providing opportunities for innovative teaching and learning in career-oriented, technological and professional education."

The Clinical Laboratory Sciences programs at Ferris State University serve well to enhance the mission of the University. The programs combine a strong emphasis on traditional sciences with liberal arts and technical education. The CLS programs emphasize orientation for professional careers. We are considered by NAACLS to be a national leader in CLS education in large part due to our innovative simulated laboratory. We have designed the course to serve as a bridge from "student" to "technologist."

B. Program Visibility and Distinctiveness

Ferris State University's CLS programs were among the first in the nation to convert from the traditional hospital-based format to an on-campus program that culminates with laboratory-based clinical experience. Grand Valley State University recently revamped their MT program and used our program as a model, including a simulated laboratory. The on-campus simulated laboratory provides cost-effective preparation for CLS students. This unusual aspect of Ferris's program enables students to be prepared to graduate and practice their profession with a much shorter internship experience. The students arrive ready to perform well at their assigned affiliate, having had considerable practice in routine testing and problem-solving lab situations on campus. This enables the clinical instructors to focus on orienting the student interns to the rapid pace and stressful conditions in today's modern clinical laboratory. The students at the affiliates are reviewing, rather than learning for the first time, the cognitive knowledge about the clinical significance of the laboratory results, correlation of results with patient diagnoses, and reviewing results for accuracy and precision and resolving problems as they occur. The students have also practiced professional behaviors on campus, including acceptable dress, adherence to safe practices, and communicating with other health care professionals.

Our program was one of the first to incorporate a laboratory information system (LIS) into the on-campus courses. The use of our LIS decreases the learning curve that a student encounters while on internship. Our extensive use of instrumentation while the student is on campus is also unusual among other CLS programs. We also were early adopters of WebCT for use while the students are on their clinical experience. This decreases costs to the University and administrative work by the education coordinator at the affiliated laboratory.

We have also increased our visibility on campus by visiting chemistry classes to introduce the students to our programs and the profession of laboratory medicine.

Taking the phlebotomy certificate off-campus will definitely increase our visibility around the state. Additionally, our programs will allow a student to potentially begin with the certificate, then ladder to the MLT and finally the MT degree. We are the only university program in the Lower Peninsula that has this distinction.

C. Program Value

The CLS programs at Ferris State University prepare a large number of the annual CLS graduates in Michigan. Additionally, we are the only program that offers CLS courses in proximity to the students in the northern lower peninsula. Program graduates have been hired statewide. Other graduates have moved to nearly every state in the nation. Besides filing the ever-growing demand for professionals in the traditional clinical laboratories, program graduates are employed in industry, laboratory management, education, research, crime labs and many other related fields.

D. Enrollment

As reported earlier, the CLS programs have not been at capacity since the last APR. However, with the help of the CAHS recruiter and extra diligence by the faculty and administration, our numbers finally appear to be on the rise. Fall 2005 marks the first time in the history of the programs that we have had to close CLLS101 due to reaching capacity! We anticipate our enrollment will increase more with the ability of students moving from the phlebotomy, to the MLT and then to the MT program.

E. Characteristics, Quality and Employability of Students

Ironically, a large number of job openings still exist, but some programs have reported decreased enrollment or have been threatened with closure. However, the CLS programs at Ferris provide an alternative for students in pre-pharmacy, pre-optometry, and other competitive programs that have more applicants than places available. They are able to complete a health-related program and gain professional employment.

The CLS programs enroll increasing numbers of nontraditional students, as well as students from traditionally under-represented groups. This is especially true of the students entering the phlebotomy certificate. We not only see an increase in the numbers of all students, but the quality, as well.

Demand for graduates continues to be strong. Despite the nearly constant re-organization and re-engineering of clinical laboratories, graduates easily find entry-level employment in a variety of settings. One hundred percent of CLS graduates are employed after one year of graduation.

F. Quality of Curriculum and Instruction

Survey of students, adjunct clinical instructors, graduates and employers of graduates all indicate that the content of the curriculum is appropriate for clinical laboratory practice. We hope they will find our improved curriculum that much better. These groups also indicate that students and graduates are well prepared to progress through the program and practice in the profession. We have included a variety of instructional methods, including web-enhanced courses, problem based learning and critical thinking to enhance student learning.

The faculty is supported in their efforts to attend and present at professional meetings. Support has also been made available for us to update our clinical skills. Visiting clinical sites helps the faculty see the changes to the modern lab and incorporate the information into their courses.

G. Composition and Quality of Faculty

Since the last APR the CLS programs have lost one-half of the content experts we feel are vital for the education of the highest quality laboratory professionals. At the same time, we have seen enrollment numbers that have remained stable and even now appear to be on the way up. In spite of teaching overloads, we participate in local, statewide, national, and international continuing education activities. In addition to attending programs the faculty has presented continuing education in a wide variety of formats and subjects. Some faculty have reviewed textbooks, served as surveyors for CLS programs undergoing re-accreditation, and are active in a variety of professional organizations.

The faculty has also served the University on a variety of College of Allied Health and the university-wide committees and task forces.

Students and graduates express satisfaction with the quality of the faculty and even rate the CLS faculty higher than faculty from other departments.

H. Academic Program Review Process

The CLS faculty appreciates the opportunity to participate in the Academic Program Review process. We understand the usefulness of the process and see its potential benefits. However, crafting a well-written detailed document is time consuming and puts a strain on small programs in which the faculty is already at load, and in some cases, teaching an overload.

In our opinion, we are a program worthy of enhancement. The rationale for our enhancement include:

- the anticipated increase in our enrollment on-campus that will be captured in the fall 2005 statistics.
- development and expansion of off-campus programs.
- conversion of additional courses to a mix-delivery format.

Appendix A: Tenured Faculty Curricula vitae

Curriculum Vitae

Daniel P. de Regnier, MS, MT (ASCP)

18865 Winding Brook Pl.
Big Rapids, MI 49307

Home (231) 592 - 0358
Office (231) 591 - 2327

dpd@charter.net

EDUCATION

UNIVERSITY OF MINNESOTA, Minneapolis, MN 55455. Master of Science, Clinical Laboratory Science. September 1988 (GPA = 3.65, A=4.00)

UNIVERSITY OF NORTHERN IOWA, Cedar Falls, IA 50614. Bachelor of Arts Degree in General Science, with honors, September 1983. (GPA = 3.29, A=4.00)

ALLEN MEMORIAL HOSPITAL SCHOOL OF MEDICAL TECHNOLOGY, Waterloo, IA 50701. MT (ASCP), August 1983

CERTIFICATION

American Society of Clinical Pathologists (ASCP) 1983; MT - 152652

EMPLOYMENT EXPERIENCE

Associate Professor and Clinical Coordinator, Clinical Laboratory Sciences — September 1992 - Present

Clinical Laboratory Sciences
FERRIS STATE UNIVERSITY
Big Rapids, MI 49307

Medical Technologist — December 1991 - August 1992

IOWA LUTHERAN HOSPITAL
Des Moines, IA 50311

Assistant Professor, Clinical Laboratory Sciences — September 1988 - July 1991

Department of Medical and Research Technology
UNIVERSITY OF MARYLAND AT BALTIMORE
Baltimore, MD 21201

Medical Technologist — January 1989 - July 1991

ASSOCIATES IN PATHOLOGY, P.A.
Baltimore, MD 21201

Medical Technologist — September 1983 - August 1985

ALLEN MEMORIAL HOSPITAL
Waterloo, IA 50701

PROFESSIONAL ORGANIZATIONS

1983 - present American Society for Clinical Laboratory Science
1987 - present American Society for Microbiology
1992 - present Michigan Society for Clinical Laboratory Science (MSCLS)
1992 - present Central Michigan Association for Medical Technology

ACADEMIC and PROFESSIONAL ACHEIVEMENTS

- American Scientific Products Graduate Scholarship, 1987
- Graduate School Academic Scholarship, University of Minnesota 1987-1988
- Recipient of Timme Center Instructional Assistance Grant to obtain educational software, $2,700
- Michigan Society for Clinical Laboratory Science Key to the Future Award, 1994
- Omicron Sigma member 1995, 1999
- Internet Course Delivery Grant: $25,000
- Professional Development Grant: "An improved Laboratory Information System for the Clinical Laboratory Sciences Program; Investigator; $9300.00
- Awarded Tenure 2000
- Donna Duberg Mentorship Award; MSCLS

PRESENTATIONS

- American Society for Microbiology, Annual meeting, Miami Beach, FL *"Giardia Cysts in the Environment: Effect of Lake, River, and Tap Water."* May, 1988
- Metropolitan Hospital, Grand Rapids, MI *"Clinical Parasitology Update."* April, 1994
- American Society for Microbiology, Annual Meeting, New Orleans, LA *"The Simulated Laboratory: A Hands-on Strategy for Educating Clinical Laboratory Science Students."* May, 1996
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Kalamazoo, MI *"Don't Drink the Water: A Review of Waterborne Pathogens."* April, 1996
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, E. Lansing, MI *"Something Old, Something Haute, Something Fuzzy, Something That's Not"* April, 1998
- Metropolitan Hospital, Grand Rapids, MI "Clinical Mycology Update." June, 1998
- Michigan College of Optometry at Ferris State University, *"Laboratory Diagnosis of Ocular Infections,"* 1998
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Romulus, MI *"Bringing Microbiology Education In-House"* April, 2000
- Lilly North Conference, September 22, 2001, Big Rapids, MI, *"The Campus Simulated Laboratory – A Transition from Student to Intern."*
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Kalamazoo, MI *"Travel Microbiology – Around the World in 80 Bugs"* April, 2002
- Big Rapids Charter School, *"What is Microbiology?"*, 2002
- Clinical Laboratory Educators Conference, March 2003, New Orleans, LA, *"The Campus Simulated Laboratory – A Transition from Student to Intern."*
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Romulus, MI *"A Sporegasboard of Fungi"* April, 2003
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Lansing, MI *"Microbiology Review"* April, 2004
- Second Biennial Distance Education Conference "Best Practices in Distance Education for Health Professions", Sept 25th, 2004; "The Use of WebCT to Facilitate the Clinical Experience"
- Michigan Society for Clinical Laboratory Sciences, Annual Meeting, Kalamazoo, MI *"Microbiology Review"* April, 2005
-

PUBLICATIONS

deRegnier, D.P, L. Cole, D.G. Schupp, and S.L. Erlandsen "Viability of *Giardia* Cysts Suspended in Lake, River, and Tap Water", Applied and Environmental Microbiology, May 1989, Vol. 55 NO. 5, pp. 1223-1229

deRegnier, Daniel P. *Case Study Number Four*, "Parasites in Human Immunodeficiency Virus," The Learning Laboratorian Series. 1994, Vol. 6 NO 3.

PROFESSIONAL ACTIVITIES

From	To	Activity
2005	Present	CLS APR committee chair
2005	Present	Tracy Glentz tenure committee member
2005	Present	Core Curriculum Review committee, CAHS
2003	Present	Program Coordinator Workload Review Task Force
2003	Present	Arts and Lectures committee
2003	Present	Student Recruitment and Retention Committee, CAHS
2002	2003	Scientific Assembly Chair-Computer Information Systems, Michigan Society for Clinical Laboratory Science
2002	Present	Core Curriculum Review committee, CAHS
2001	Present	Instructional Resource Committee, College of Allied Health Sciences
2001	Present	Scientific Understanding Assessment Committee member, Ferris State University
2001	Present	Web Content Coordinator, College of Allied Health Sciences
2000	2002	MSCLS Nominations committee chair
1999	2000	Chair, Library/Historical/Archival Committee, Ferris State University
1999	2000	CCHS103 development committee; ad hoc
1999	2000	Dean of College of Allied Health Sciences search committee
1998	2000	District 8 Representative. Michigan Society for Clinical Sciences
1998	1999	CCHS101 development committee member
1997	1998	Instructional Performance Systems, Inc software reviewer
1997	1997	Cumulative Performance Review Committee
1996	1997	Respiratory Care Program Review Committee
1995	1997	Chair, Library/Historical/Archival Committee, Ferris State University
1995	Present	Safety Committee, College of Allied Health Sciences
1994	Present	Member, Library/Historical/Archival Committee, Ferris State University
1993	Present	Board of Directors, Michigan Society for Clinical Laboratory Science, webmaster and information services
1993	1995	Scientific Assembly Chair-Microbiology, Michigan Society for Clinical Laboratory Science
1993	1995	Program Committee, Michigan Society for Clinical Laboratory Science State Meeting
1993	1999	Legislative Steering Committee, Michigan Society for Clinical Laboratory Science
1993	1994	College of Allied Health Sciences 25th Anniversary Committee Ferris State University
1993	Present	Mentor, Mecosta/Osceola Math/Science/Technology Center
1993	Present	Monday Night Technology, Mecosta/Osceola Math/Science/Technology Center
1992	Present	Faculty Advisor - Association of Clinical Laboratory Sciences, Student Organization, Ferris State University

Teaching Responsibilities at Ferris State University

Course Number	Course Name
CLLS101	Clinical Laboratory Science Orientation
CLLS235	Diagnostic Microbiology
CLLS240	Medical Mycology, Virology, and Parasitology
CLLS251	Basic and Clinical Immunology
CLLS256	MLT Simulated Laboratory (team teach)
CLLS435	Advanced Diagnostic Microbiology
CLLS456	MT Simulated Laboratory (team teach)
CLLS499	Clinical Laboratory Science Seminar

Non-teaching Responsibilities at Ferris State University

Academic advisor
MLT Clinical Coordinator
College of Allied Health and Clinical Laboratory Sciences Webmaster
Faculty resource for WebCT
Recruiting

I have asked the following colleagues to provide references

John Landis, MS, MT (ASCP), Emeritus
Clinical Laboratory Sciences
9267 Elmwood Ct
Stanwood, MI
231-972-3791
landisj@ferris.edu

Julian Easter
Dean of Health Sciences
Northcentral Technical College
Wausau, WI 54401
715-675-3331 x4511
easter@ntc.edu

Jerry Laurich, Ph.D.; Assistant Professor
Pikeville College School of Osteopathic Medicine
ARM 425
147 Sycamore St
Pikeville, KY 41501
606 218 5430
jlaurich2@mac.com

CURRICULUM VITAE
BARBARA A. ROSS

Address:	**Home:** 16809 125th Avenue Rodney, MI 49342	**Business:** Ferris State University 200 Ferris Drive Big Rapids, MI 49307-2740
Telephone:	231-867-3631	231-591-2317
Fax:		231-591-3788
e-mail:	SEROSS@TUCKER-USA.COM	ROSSB@FERRIS.EDU

Education:

Institution	**Field of Study**	**Degree**	**Year**
Albion College Albion, MI	Biology, English	A.B. (honors)	1970
Kent State University Kent, OH	Chemistry	-----	1970
Akron City Hospital Akron, OH	Medical Technology	MT(ASCP)	1971
Central Michigan University Mt. Pleasant, MI	Biology/Biochemistry Health Services Admin.	30 credits 30 credits	1977-80 1985-90
University of California, Los Angeles	Online Technology	4 credits	1998
University of Medicine and Dentistry of New Jersey	Health Systems	MS	2004

Professional Certification: MT #079289 American Society of Clinical Pathologists

Experience:

Ferris State University: Big Rapids, MI	Program Coordinator and Assistant Professor Clinical Coordinator and Assistant Professor Education Coordinator and Instructor Acting Program Director Teaching Assistant	2004 – present 1981 – 2004 1978 – 1980 1979 1976 – 1978
Robinson Memorial Hospital Ravenna, OH	Staff Technologist	1975 – 1976
St. Vincent's Medical Center Jacksonville, FL	Section Supervisor, Special Chemistry Staff Technologist	1974 – 1975 1973 – 1974
South County Hospital Wakefield, RI	Section Supervisor, Hematology Staff Technologist	1972 – 1973
Robinson Memorial Hospital Ravenna, OH	Staff Technologist	1971 – 1972

Current Teaching Schedule:

CLLS 191: Clinical Experience in Phlebotomy
CLLS 215: Clinical Chemistry
CLLS 228: Immunohematology
CLLS 256: Simulated Clinical Laboratory
CLLS 291: Applied Clinical Practicum
CLLS 355: Clinical Chemistry 2
CLLS 456: Clinical Laboratory Practicum
CLLS 459: Advanced Problem Solving in Immunohematology
CLLS 465: General and Technical Supervision in Clinical Laboratory Science
CLLS 491: Clinical Laboratory Practice
CLLS 494: Management Practice in Clinical Laboratory Science

Courses Taught Previously:

MLT 101: Orientation to Medical Laboratory Technician Program
MLT 105: Introduction to Clinical Laboratory Techniques
MLT 202: Clinical Chemistry and Instrumentation
MLT 228: Immunology and Immunohematology
MDT 101: Orientation to Medical Technology
MDT 334: Clinical Chemistry and Instrumentation 1
MDT 338: Immunohematology 1
MDT 454: Clinical Chemistry and Instrumentation 2
MDT 458: Immunohematology 2
MDT 460: Procedural Evaluation
MDT 461: Clinical Laboratory Education
CLLS 256: Simulated Clinical Laboratory
CLLS 270: Applied Clinical Chemistry
CLLS 271: Applied Clinical Body Fluid Analysis
CLLS 272: Applied Clinical Microbiology
CLLS 273: Applied Clinical Hematology
CLLS 274: Applied Clinical Immunohematology
CLLS 275: Applied Clinical Coagulation
CLLS 276: Applied Clinical Serology
CLLS 291: Clinical Laboratory Practicum
CLLS 463: Clinical Laboratory Management, Supervision, and Education
CLLS 481: Clinical Chemistry Practice
CLLS 482: Clinical Body Fluid Practice
CLLS 483: Clinical Microbiology Practice
CLLS 484: Clinical Hematology Practice
CLLS 485: Clinical Immunohematology Practice
CLLS 486: Clinical Coagulation Practice
CLLS 487: Clinical Serology Practice
CLLS 491: Clinical Laboratory Practice
CLLS 499: Clinical Laboratory Sciences Seminar
FSUS 100: Ferris State University Freshman Seminar 1
FSUS 101: Ferris State University Freshman Seminar 2
MA 229: Laboratory Techniques for Medical Assistants

Administrative Duties:

- Establish new programs and coordinate existing programs at multiple sites
- Recruit and retain students
- Maintain accreditation and approval for programs with NAACLS and Ferris State University
- Prepare self study documents and coordinate program site visits
- Plan and conduct adjunct instructor meetings, advisory committee meetings, and program meetings
- Cooperate with program and clinical faculty to maintain program quality
- Provide applications and instruction for national certification examinations and state licensure, when applicable
- Coordinate development, administration, evaluation, and updating of "mock" certification examinations (statewide competition)
- Advise and counsel students
- Order and maintain supplies and equipment for courses taught
- Assist in development and updating of on-campus and clinical course objectives
- Assist clinical coordinator in locating and establishing clinical sites
- Monitor graduate placement and follow-up; survey graduates and employers
- Assist in curriculum and course development
- Assist in grant development
- Chair committees for Academic Program Review

College and University Committees:

- Ferris State College Educational Planning Committee, 1980 – 1984
- Ferris State College Ophthalmic Dispensing Program Review Committee, 1983
- Ferris State College Health Services Management Program Review Committee, 1984
- School of Allied Health Dean's Search Committee, 1985 – 1986
- College of Allied Health Sciences Curriculum Committee, 1987 – 1990, 1992 – 1995, chair, 1994 – 1995
- College of Allied Health Sciences Task Force on Clerical Staff Reorganization, 1991
- College of Allied Health Sciences Task Force on Administrative Restructuring, 1992
- College of Allied Health Sciences Tenure Committee, 1990 – 1993, Chair, 1992 – 1993
- College of Allied Health Sciences Faculty Development Committee, 1992 – 1995
- College of Allied Health Sciences Recruitment-Retention Committee, 1992 – 1995
- College of Allied Health Sciences Planning Committee, 1993 – 1996
- College of Allied Health Sciences Task Force on Committee Structure (Chair), 1996
- College Of Allied Health Sciences Committee for Core Curriculum Planning, 1997 – 1999
- Ferris State University Sabbatical Leave Committee, 1994
- Ferris State University Student Health Advisory Committee, 1990 – 1993
- Ferris State University Human Subjects Review Committee, 1992 – 1995
- Ferris State University Planning Committee for Health Professions Futures Conference, 1996 – 1997
- Ferris State University Web Instruction Committee, 1998 – 1999
- Ferris State University Reading Outcomes Assessment Committee, 2000 – 2003
- Candidate's Tenure Committee, Mrs. Lori Seiler, 1993 – 1996 (Chair)
- Candidate's Tenure committee, Dr. Mark Kellogg, 1993 – 1997 (Chair)
- Candidate's Tenure Committee, Mr. Daniel deRegnier, 1995 – 1999
- Candidate's Tenure Committee, Dr. Omar Baker, 2004 – present
- Clinical Laboratory Sciences Program Academic Program Review Committees, 1996 and 1999 (chair both times), 2005
- Ferris State University Reading Assessment Committee, 2000 – present
- College of Allied Health Sciences Dean's Faculty Advisory Committee, 2000 – 1

College and University Committees, continued:

- College of Allied Health Sciences Faculty Affairs Committee, 2001 – present
- Respiratory Care Program Academic Program Review Committee, 2001 – 2002
- College of Allied Health Sciences Alumni and Development Committee, 2003 – present
- College of Allied Health Sciences Associate Dean Search Committee, 2004
- College of Allied Health Sciences Recruitment and Retention Committee, 2004 – present
- College of Allied Health Sciences Curriculum Assessment Committee, 2004 – present
- Ferris State University Task Force on Implementation of General Education, 2004

Professional Society Memberships:

American Society for Medical Technology, 1979 – 1985
American Society for Clinical Laboratory Science, 1994 – present
American Association of Blood Banks, 1979 – present
Ferris Professional Women, 1981 – present; Treasurer, 1985 – 1986
Clinical Laboratory Management Association, 1985 – present
American Society of Clinical Pathologists, Associate Member, 1994 – present
Michigan Association of Blood Banks, 1979 – present
CLMA, Michigan Chapter, 1988 – present
Central Michigan Association of Medical Technologists, 1978 – 1979; 1993 – present
Ferris State University Discussion Group: Faith in the Academy, 1995 – 1998
International Alliance of Teacher Scholars, Inc. 2001 – Present

Professional Society Committees:

CLMA Education Committee, 1985 – 1988

Other Professional Activities:

Evaluation of NCAMLP MLT Examination Questions, 1979
Michigan Joint Council for Continuing Education for Medical Laboratory Personnel, 1979 – 1981
NAACLS site surveyor: Southwest General Hospital School of Medical Technology, 1988
State University of New York at Alfred, 1997 (captain)
Trocaire College, 1997
Minnesota Institute of Medicine, 1999 (captain)
University of Kentucky, 2005
NAACLS paper reviewer: Cincinnati State Technical and Community College, 1998
Central Washington University, 1999
Consultant in Blood Banking, Reed City Hospital, Reed City, MI, 1993 – 1994
Ferris State University Faculty Mentor for four faculty
Volunteer Assistant for MSMT Student Competitions, 1981, 1983 – 1984, 1994- present
People to People Citizen Ambassador Program Delegate to Russia, Poland, and Hungary, 1994
Ferris State University Faculty Summer Institute delegate, 1997
Faculty advisor for Wesley Foundation at Ferris State University, 2000 – 2004
Vice President, Wesley Foundation at Ferris State University Board of Directors, 2000 – 2001
West Michigan Board of Higher Education and Campus Ministry Member, 1998 – present, chair 2004 –
Facilitator for College of Allied Health Sciences Workshop: Team Building Skills, 1995
Moderator for Michigan Society for Clinical Laboratory Science Annual Meeting: Antibody Identification, 1998
Moderator for Michigan Society for Clinical Laboratory Science Annual Meeting: Stem Cell Transplantation Program, 1999
Moderator for MSCLS Annual Meeting, 2001 (three sessions), 2002 (four sessions), 2004 (three sessions)

Other Professional Activities, continued:

Moderator for Clinical Laboratory Management Association Annual Meeting: Creating the Value-Added Services Wanted by Managed Care Plans, 1999
Moderator for Clinical Laboratory Management Association Annual Meeting: Systems Thinking: Managing the Pieces as Part of the Whole, 2000

Publications:

"Viewpoint: Educator Addresses Laboratory Staffing Shortage Issue," *Vantage Point*, Volume 3, Number 21, November 26, 1999

Continuing Education Programs Attended:

Hyland Coagulation Workshop, 1973
Behring Diagnostics Immunology Workshop, 1977
Helena Electrophoresis Workshop, 1978
Michigan Association of Blood Banks Spring Workshops, 1978, 1979, 1994, 1995
Michigan Association of Blood Banks Annual Meetings, 1978-82, 1985
AABB Workshop: Competency Evaluation of Blood Bank Personnel, 1980
AABB Workshop: Pretransfusion Testing for the '80s, 1980
AABB Workshop: Therapeutic Hemapheresis, 1981
AABB Workshop: Women in Management, 1981
MSMT Workshop: Cost Analysis in Clinical Education, 1983
AACC Annual Meeting, 1983
AACC Workshop: Case Studies in Clinical Chemistry, 1983
AACC Workshop: Procedural Evaluation, 1983
Ferris State College: Computers in Education, 1984
Clinical Laboratory Management Association Regional Meetings, 1985, 1992
ASCP Workshop: Using Statistics in the Clinical Laboratory, 1985
ASCP workshop: Common and Uncommon Problems in Hematology, 1985
Clinical Laboratory Management Association Annual Meetings, 1985, 1988, 1999, 2000, 2001
CLMA workshop: Laboratory Management in Transition, 1985
CLMA Seminar: Growth, Quality, and Communication in Today's Laboratory, 1990
Ann Arbor Seminars: Current Topics in Blood Banking, 1979, 1984, 1986, 1988-90, 1992-3, 1995-8
Michigan Society for Medical Technology/Clinical Laboratory Science Annual Meetings, 1980-1, 1983-5, 1993-4, 1996-9, 2001, 2002
Central Michigan Association of Medical Technologists Meetings, 1993-present
ASCP Workshop: Statistics, Quality Control, and CLIA 88, 1994
ASCP Workshop: Competency Testing, 1994
ASCP Workshop: Total Quality Management for the Laboratory, 1994
NAACLS Site Visitor Training Workshop, 1994
Abbott Diagnostics Division: Hepatitis Testing, 1994
AACC Symposium: Laboratory 2000, 1995
International Multiskilling Conference, Indianapolis, 1997
ASCP Teleconferences: Prions: From Protein to Pathogen, 1998
Chronically Transfused Patients: Impact on the Blood Bank, 1999
Ferris State University: Health Professions Futures Conference, 1997
Ferris State University: Office of Affirmative Action Harassment/Sensitivity Training, 1998
Ferris State University Center for Teaching, Learning and Faculty Development: Evaluating your Teaching, 1998
Central Michigan Association for Medical Technologists: Cord Blood Stem Cell Banking, 2001
Georgetown University Teleconference: Setting Up and Optimizing HLA Typing by SSP, 1999
Clinical Laboratory Management Association Annual Meetings, 1999, 2000
Ferris State University: Programmatic Marketing, 1999, 2000

Continuing Education Programs Attended, continued:

AABB Teleconferences: Changes in the Standards, 15th edition, 1995
Changes in Standards, 16th edition, 1996
Technical Manual Update, 1996
Peripheral Blood Progenitor Cell Transplantation, 1997
Transfusion Strategies in Cardiac Surgery, 1997
The FDA Inspection: Prayer and Preparation, 1998
Benchmarking your Laboratory, 1998
Customer Surveys: A Valuable Tool for Quality Improvement, 1998
Changes in the Standards (19th edition), 1999
Transfusion Reactions: Results of the BaCon Study, 1999
Changes in the Standards (20th edition), 2001
Serological Problem Solving, 2003
Transfusion Associated Acute Lung Injury, 2005
ASCP-AMS Educators Consensus Conference, 2000
Ferris State University: Authentic Assessment: Assessing Beyond Standard Tests, August, 2000
Ferris State University Summer University, July 2001
Ferris State University College of Pharmacy, HIPAA, January 2002
Ferris State University: FSU's HIPAA Privacy Policies and Procedures, April 2003
Ferris State University: HIPAA: Train the Trainer, April, 2003
NAACLS Futures Conference, 2004
ASCP Teleconferences: Current Issues in Phlebotomy, 2004
Legal Issues in Phlebotomy, 2004
I Won't Make That Mistake Again! Case Studies in Immunohematology, 2004
Central MI Association of Medical Technologists: Tumor Markers, 2004
Central MI Association of Medical Technologists: Bacterial Contamination of Platelets, 2004

Continuing Education Presentations:

Michigan Association of Blood Banks Workshop: Recognition and Management of Problems Associated with Pre Transfusion Testing,

- Ferris State College, 1979
- Muskegon Community College, 1980
- Michigan Department of Public Health, 1981

Applications of Chemistry in the Clinical Laboratory, Super Saturday for Eighth Graders, 1982
Rotary Club of Big Rapids: Current Developments in the Clinical Laboratory, 1988
Michigan Association of Blood Banks Workshop: Transfusion Reactions, 1989
Poster Session: "The Key to Student Retention: Early Intervention," Association of Schools of Allied Health Professions, 1993
Case Study: "Just Another Night in the Blood Bank," FSU/Michigan State University Distance Learning Program, 1994
Central Michigan Association of Medical Technologists: Blood Banking in Eastern Europe, 1996
College of Allied Health Sciences Workshop: Core Curriculum in Allied Health: 1996
College of Allied Health Sciences Workshop: Problem Based Learning: 1997 (planning)
FSU Honors Program Students: Blood Banking in Eastern Europe, 1998
Clinical Laboratory Management Association Staffing Shortage Forum, 2001: "Staffing Shortage from an Educator's Viewpoint"
Michigan Society for Clinical Laboratory Science Annual Meeting: Blood Bank Case Studies and Review of Component Therapy, 2001
Lilly North Educational Conference, "The Campus Simulated Laboratory", 2001
What Sunday School Teachers and Church Volunteers Need to Know about Blood Borne Pathogens, 2002

Appendix B: Curriculum Check Sheets

FERRIS STATE UNIVERSITY
COLLEGE OF ALLIED HEALTH SCIENCES
Medical Technology – Bachelor of Science Degree

Fall, Year 1		**Credit**
BIOL 121	General Biology 1	4 ___
CCHS 102	Safety Issues in Health Care	1 ___
CHEM 114	Intro. to General Chemistry	4 ___
*FSUS 100	Ferris State University Seminar	1 ___
MATH 117	Contemporary Mathematics	4 ___
Social Awareness Elective		3 ___
		16-17

Winter, Year 1		
BIOL 122	General Biology 2	4 ___
CLLS 101	Clin. Lab Science Orientation	1 ___
CHEM 214	Fund. of Organic Chemistry	4 ___
ENGL 150	English 1	3 ___
MRIS 102	Orient. to Medical Vocabulary	1 ___
Cultural Enrichment Elective		3 ___
		16

Fall, Year 2		
BIOL 205	Human Anatomy & Physiology	5 ___
CCHS 101	Orientation to Health Care	3 ___
CCHS 103	Clin. Skills for Health Care Providers	1 ___
CHEM 324	Fundamentals of Biochemistry	3 ___
COMM 221	Small Group Decision Making	3 ___
		15

Winter, Year 2		
BIOL 286	General Microbiology	3 ___
BIOL 300	Pathophysiology	3 ___
EHSM 315	Epidemiology & Statistics	3 ___
ENGL 250	English 2	3 ___
Social Awareness Elective		3 ___
		15

Summer, Year 2		
CLLS 215	Clinical Chemistry	4 ___
CLLS 224	Body Fluid Analy. & Hemostasis	3 ___
CLLS 251	Intro. to Clinical Immunology	3 ___
Cultural Enrichment Elective		3 ___
		13

Fall, Year 3		**Credit**
CLLS 228	Immunohematology	3 ___
CLLS 230	Hematology	3 ___
CLLS 235	Diagnostic Microbiology	4 ___
CLLS 355	Advanced Clin. Chemistry	3 ___
MGMT 301	Applied Management	3 ___
		16

Winter, Year 3		
CLLS 240	Medical Mycology, Parasitology, and Virology	2 ___
CLLS 430	Advanced Hematology	3 ___
CLLS 435	Advanced Diagnostic Microbiology	4 ___
CLLS 440	Advances in Clinical Lab Medicine	2 ___
CLLS 459	Advanced Problem Solving in Immunohematology	1 ___
ENGL 321	Advanced Composition	3 ___
		15

Fall, Year 4		
CLLS 456	Clinical Lab Practicum	3 ___
CLLS 465	General and Technical Supervision in CLS	3 ___
CLLS 499	Clin. Lab Science Seminar	1 ___
HCSA 335	Supervisory Practices for Health Care Workers	4 ___
Cultural Enrichment Elective		3 ___
Social Awareness Elective		3 ___
		17

Winter, Year 4		
**CLLS 491	Clinical Laboratory Practice	15 ___
CLLS 494	Management Practice in CLS	1 ___
		16
Computer Competency		___

*FTIAC only.
**Internship is for 18 weeks

Students must meet the following University requirements: Cultural Enrichment – select three (3) courses with one at the 200 level or above; Social Awareness – Three (3) courses in two different areas, including one "Foundation" course, at the 200 level or higher, and one fulfilling race, ethnicity, and/or gender requirement. One of the Cultural Enrichment **OR** Social Awareness courses must fulfill Global Consciousness requirement. Students must earn a grade of C or better in the CAHS core courses, all CLLS courses, BIOL 205, CHEM 214, and CHEM 314.

139 – 140 credits required for graduation

Revised 4/8/00
Revised 5/15/03
Revised 2/18/05

FERRIS STATE UNIVERSITY
COLLEGE OF ALLIED HEALTH SCIENCES
Medical Laboratory Technology – Associate in Applied Science Degree

Fall, Year 1		Credit
BIOL 108	Medical Microbiology	3 ____
CCHS 102	Safety Issues in Health Care	1 ____
CHEM 114	Intro. to General Chemistry	4 ____
ENGL 150	English 1	3 ____
*FSUS 100	Ferris State University Seminar	1 ____
MATH 117	Contemporary Mathematics	4 ____
MRIS 102	Medical Terminology	1 ____
		16-17

Fall, Year 2		Credit
CLLS 228	Immunohematology	3 ____
CLLS 230	Hematology	3 ____
CLLS 235	Diagnostic Microbiology	4 ____
ENGL 250	English 2	3 ____
Social Awareness Elective		3 ____
		16

Winter, Year 1		
BIOL 205	Human Anatomy & Physiology	5 ____
CCHS 101	Orientation to Health Care	3 ____
CCHS 103	Clinical Skills for Health Care Providers	1 ____
CHEM 214	Fund. of Organic Chemistry	4 ____
CLLS 101	Clinical Lab. Science Orient.	1 ____
COMM 221	Small Group Decision Making	3 ____
		17

Winter, Year 2		
CLLS 240	Medical Mycology, Parasitology, & Virology	2 ____
CLLS 256	Simulated Clinical Lab.	3 ____
**CLLS 291	Applied Clinical Practicum	12 ____
		17
Computer Competency		____

Summer, Year 1		
CLLS 215	Clinical Chemistry	4 ____
CLLS 224	Body Fluid Analysis and Hemostasis	3 ____
CLLS 251	Intro. to Clinical Immunology	3 ____
Cultural Enrichment Elective		3 ____
		13

*FTIAC only.
**Internship is for 14 weeks

Students must earn a C or better in the CAHS core courses, all CLLS classes, CHEM 214, and BIOL 205.

79 – 80 total credits

Effective Fall 2005

FERRIS STATE UNIVERSITY
COLLEGE OF ALLIED HEALTH SCIENCES
Medical Laboratory Technology – Associate in Applied Science Degree

Name_____ **Student Number**_____

COMMUNICATION COMPETENCE: 9 CREDITS REQUIRED				
ENGL	150	English 1	3	
ENGL	250	English 2 (ENGL 150)	3	
Recommended: COMM **Also Accepted:** COMM	221 105 121	Small Group Decision Making Interpersonal Communication **OR** Fundamentals of Public Speaking	3	
QUANTITATIVE SKILLS: PROFICIENCY OR COURSE REQUIRED				
Recommended: MATH **Also Accepted:** MATH	117 115	Contemporary Mathematics or ACT Math subscore of 24 Intermediate Algebra	4 4	
SOCIAL AWARENESS: 3 CREDITS REQUIRED				
		Hyperlink to Social Awareness Courses Social Awareness Elective	3	
CULTURAL ENRICHMENT: 3 CREDITS REQUIRED				
		Hyperlink to Cultural Enrichment Elective: Cultural Enrichment Elective	3	
SCIENTIFIC UNDERSTANDING: 16 CREDITS REQUIRED				
BIOL	108	Medical Microbiology (none)	3	
BIOL	205	Human Anatomy and Physiology (CHEM 114)	5	
CHEM	114	Introduction to General Chemistry (CHEM 103 or HS Chem and Math 110 or ACT 19)	4	
CHEM	214	Fundamentals of Organic Chemistry (CHEM 114 or 121)	4	
CAHS CORE REQUIREMENTS:				
CCHS	101	Orientation to Health Care	3	
CCHS	102	Safety Issues in Health Care	1	
CCHS	103	Clinical Skills for Health Care Providers (CAHS enrollment)	1	
		Computer Competency		
MRIS	102	Orientation to Medical Vocabulary or Medical Terminology Competency	1	
MLT MAJOR: 42 CREDITS REQUIRED				
CLLS	101	Clinical Laboratory Science Orientation (none)	1	
CLLS	122	Introduction to Specimen Collection (concurrent enrollment in CLLS 123)	2	
CLLS	123	Specimen Collection Laboratory (concurrent enrollment in CLLS 122)	1	
CLLS	216	Clinical Chemistry (BIOL 205, CHEM 214; concurrent enrollment in CLLS 217)	3	
CLLS	217	Clinical Chemistry Laboratory (concurrent enrollment in CLLS 216)	1	
CLLS	218	Body Fluid Analysis (BIOL 205)	1	
CLLS	219	Hemostasis (BIOL 205)	1	
CLLS	220	Body Fluid and Hemostasis Laboratory (concurrent enrollment in CLLS 218 and 219)	1	
CLLS	231	Hematology (BIOL 205, CHEM 214, concurrent enrollment in CLLS 232)	2	
CLLS	232	Hematology Laboratory (concurrent enrollment in CLLS 231)	1	
CLLS	236	Diagnostic Microbiology (BIOL 108 or 286; BIOL 205, CHEM 214, concurrent enrollment in CLLS 237)	2	
CLLS	237	Diagnostic Microbiology Laboratory (concurrent enrollment in CLLS 236)	2	

CLLS	241	Medical Virology/Mycology/Parasitology (BIOL 108 or 286, concurrent enrollment in CLLS 242)	2	
CLLS	242	Medical Virology/Mycology/Parasitology Laboratory (concurrent enrollment in CLLS 241)	1	
CLLS	252	Introduction to Clinical Immunology (BIOL 205, concurrent enrollment in CLLS 253)	2	
CLLS	253	Introduction to Clinical Immunology Laboratory (concurrent enrollment in CLLS 252)	1	
CLLS	256	Simulated Clinical Laboratory (CLLS 217, 220, 232, 237, 253, 259)	3	
CLLS	258	Immunohematology (BIOL 205, CLLS 251 and 252, concurrent enrollment in CLLS 259)	2	
CLLS	259	Immunohematology Laboratory (concurrent enrollment in CLLS 258)	1	
CLLS	281	Application of Clinical Laboratory Science (CLLS 256)	1	
CLLS	292	Applied Clinical Practicum 1 (CLLS 256)	6	
CLLS	293	Applied Clinical Practicum 2 (CLLS 292)	5	

Students must earn a C or better in the CAHS core courses, all CLLS classes, CHEM 214, and BIOL 205.

83 – 84 total credits

Revised 4/5/00
Revised 5/15/03
Revised 4/26/05

EFFECTIVE FALL 2007

FERRIS STATE UNIVERSITY
COLLEGE OF ALLIED HEALTH SCIENCES
Medical Technology – Bachelor of Science Degree

Name _____ **Student Number** _____

		CAHS Core Curriculum Requirements: 6-7 credits Required		
CCHS	101	Orientation to Health Care (none)	3	
CCHS	102	Safety Issues in Health Care (none)	1	
CCHS	103	Clinical Skills for Health Care Providers (CAHS enrollment)	1	
MRIS	102	Orientation to Medical Vocabulary (none)	1	
FSUS	100	Ferris State University Seminar (none) – FTIAC only	1	
		Computer Competency		
		Clinical Laboratory Sciences Courses: 62 Credits Required		
CLLS	101	Clinical Laboratory Science Orientation (none)	1	
CLLS	122	Introduction to Specimen Collection (none)	2	
CLLS	123	Specimen Collection Laboratory (concurrent enrollment in CLLS 122)	1	
CLLS	216	Clinical Chemistry (BIOL 205, CHEM 214, concurrent enrollment in CLLS 217)	3	
CLLS	217	Clinical Chemistry Laboratory (concurrent enrollment in CLLS 216)	1	
CLLS	218	Body Fluid Analysis (BIOL 205, concurrent enrollment in CLLS 219 and 220)	1	
CLLS	219	Hemostasis (BIOL 205, concurrent enrollment in CLLS 218 and 220)	1	
CLLS	220	Body Fluid Analysis and Hemostasis Laboratory (concurrent enrollment in CLLS 218 and 219)	1	
CLLS	231	Hematology (BIOL 205, CHEM 214, concurrent enrollment in CLLS 232)	2	
CLLS	232	Hematology Laboratory (concurrent enrollment in CLLS 231)	1	
CLLS	236	Diagnostic Microbiology (BIOL 108 or 286, BIOL 205, CHEM 214, concurrent enrollment in CLLS 237)	2	
CLLS	237	Diagnostic Microbiology Laboratory (concurrent enrollment in CLLS 236)	2	
CLLS	241	Medical Virology/Mycology/Parasitology (BIOL 108 or 286, concurrent enrollment in CLLS 242)	2	
CLLS	242	Medical Virology/Mycology/Parasitology Laboratory (concurrent enrollment in CLLS 241)	1	
CLLS	252	Introduction to Clinical Immunology (BIOL 205, concurrent enrollment in CLLS 253)	2	
CLLS	253	Introduction to Clinical Immunology Laboratory (concurrent enrollment in CLLS 252)	1	
CLLS	258	Immunohematology (BIOL 205; CLLS 251, 252, concurrent enrollment in CLLS 259)	2	
CLLS	259	Immunohematology Laboratory (concurrent enrollment in CLLS 258)	1	
CLLS	356	Advanced Clinical Chemistry (CLLS 216, EHSM 315, concurrent enrollment in CLLS 357)	2	
CLLS	357	Advanced Clinical Chemistry Laboratory (concurrent enrollment in CLLS 356)	1	
CLLS	431	Advanced Hematology (CLLS 218, 219, 220, 231, 232, concurrent enrollment in CLLS 432)	2	
CLLS	432	Advanced Hematology Laboratory (concurrent enrollment in CLLS 431)	1	
CLLS	436	Advanced Diagnostic Microbiology (CLLS 236, concurrent enrollment in CLLS 437)	2	
CLLS	437	Advanced Diagnostic Microbiology Laboratory (concurrent enrollment in CLLS 436)	2	
CLLS	456	Clinical Laboratory Practicum (CLLS 356, 431, 437, 459)	3	
CLLS	458	Advanced Immunohematology (CLLS 252, 258, concurrent enrollment in CLLS 459)	1	
CLLS	459	Advanced Immunohematology Laboratory (concurrent enrollment in CLLS 458)	1	
CLLS	465	Management of the Clinical Laboratory (CLLS 356, 431, 436, 458)	3	
CLLS	480	Clinical Laboratory Science Applications (concurrent enrollment in CLLS 491)	1	
CLLS	491	Clinical Laboratory Practice (CLLS 456, concurrent enrollment in CLLS 481)	14	

		Clinical Laboratory Sciences Courses: 62 Credits Required, cont		
CLLS	494	Management Practice in Clinical Laboratory Science (CLLS 465)	1	
CLLS	499	Clinical Laboratory Science Seminar (last semester on campus)	1	
		Communication Competence: 12 Credits Required		
Recommended: COMM **Also Accepted:** COMM	221 105 121	Small Group Decision Making (none) Interpersonal Communication **OR** Fundamentals of Public Speaking	3	
ENGL	150	English 1 (ENGL 074 or ACT 14)	3	
ENGL	250	English 2 (ENGL 150)	3	
ENGL	321	Advanced Composition (ENGL 250)	3	
		Scientific Understanding: 26 Credits Required		
BIOL	103	Biological Concepts (none)	4	
BIOL	108 or 286	Medical Microbiology (none) OR General Microbiology (CHEM 122)	3	
BIOL	205	Human Anatomy and Physiology (CHEM 114)	5	
BIOL	300	Pathophysiology (BIOL 205 and CHEM 214)	3	
CHEM	114	Introduction to General Chemistry (CHEM 103 or HS Chem and Math 110 or ACT 19)	4	
CHEM	214	Fundamentals of Organic Chemistry (CHEM 114 or 121)	4	
CHEM	324	Fundamentals of Biochemistry (CHEM 214)	3	
		Quantitative Skills: Proficiency or 4 Credits Required		
Recommended: MATH **Also Accepted:** MATH	117 115	Contemporary Mathematics (MATH 110 or ACT 19) Intermediate Algebra	4	
		Cultural Enrichment: 9 Credits Required		
		Cultural Enrichment Elective	3	
		Cultural Enrichment Elective	3	
		Cultural Enrichment Elective (200 level or above)	3	
		Social Foundations: 9 Credits Required		
		Social Foundations Elective	3	
		Social Awareness Elective	3	
		Social Awareness Elective (200 level or above)	3	
		Other Requirements (7 Credits Required)		
EHSM	315	Epidemiology and Statistics (none)	3	
HCSA	335	Supervisory Practices for Health Care Workers (none)	4	

Progression: Students must complete BIOL 205, CHEM 214, all CLLS courses and CAHS courses with a grade of C or better. Students who return to the University after an interrupted enrollment (not including summer semester) must meet the requirements of the curriculum which are in effect at the time of their return, not the requirements which were in effect when they were originally admitted.

*FTIAC only.
**Internship is for 18 weeks
Students must meet the following University requirements: Cultural Enrichment – select three (3) courses with one at the 200 level or above; Social Awareness – Three (3) courses in two different areas, including one "Foundation" course, at the 200 level or higher, and one fulfilling race, ethnicity, and/or gender requirement. One of the Cultural Enrichment **OR** Social Awareness courses must fulfill Global Consciousness requirement. Students must earn a grade of C or better in the CAHS core courses, all CLLS courses, BIOL 205, CHEM 214, and CHEM 324.

142 – 143 credits required for graduation

Revised 4/8/00
Revised 5/15/03
Revised 2/18/05
Revised 5/2/05

Effective Fall 2005

FERRIS STATE UNIVERSITY
COLLEGE OF ALLIED HEALTH SCIENCES
CERTIFICATE IN PHLEBOTOMY

Name_____ **SS#**_____

		REQUIRED CERTIFICATE COURSES – 12 Credits		
CCHS	101	Orientation to Health Care (none)	3	
CCHS	102	Safety Issues in Health Care (none)	1	
CLLS	122	Introduction to Specimen Collection (concurrent enrollment in CLLS 123)	2	
CLLS	123	Specimen Collection Laboratory (concurrent enrollment in CLLS 122)	1	
CLLS	191	Clinical Experience in Phlebotomy (CLLS 101, 102; CLLS 122, 123; MRIS 102 with a grade of C or better)	4	
MRIS	102	Orientation to Medical Vocabulary	1	
		TOTAL CREDITS REQUIRED FOR CERTIFICATE	**12**	

Progression: Students must complete all other courses with a grade of C or better before enrolling in CLLS 191.

Students who return to the University after an interrupted enrollment (not including summer semester) must meet the requirements of the curriculum which are in effect at the time of their return, not the requirements which were in effect when they were originally admitted.

5/04/04
Revised 4/14/05

Appendix C: Sample Course Syllabi

Appendix C: Sample Course Syllabi

CLLS 101 - Clinical Laboratory Science Orientation Fall 2004

COURSE DESCRIPTION:

Introduction to the profession of clinical laboratory science to include curricula, roles of laboratory science professionals, career and employment opportunities and standards and ethics of the profession.

CREDITS: 1 **CONFIGURATION:** 1 Lec Hour/Week

INSTRUCTOR: Daniel P deRegnier, M.S., MT(ASCP)

TELEPHONE: OFFICE: 591-2327
E-Mail: deregnid@ferris.edu

OFFICE HOURS: M: 14:00 – 16:00
T – R: 09:00 – 10:00

Feel free to contact me for appointments at other times than those listed.

CLASS SESSIONS: Lecture and discussion on Monday at 6:00 p.m. in VFS 425

EVALUATION:

2 Quizzes	= 35 %
Lab Visitation Report	= 15 %
Sim Lab Report	= 10 %
Literature Review Paper	= 25 %
Attendance and Participation	= 15 %
	100 %

Grade	%	Grade	%	Grade	%
A	93-100	B-	80-82.9	D+	67-69.9
A-	90-92.9	C+	77-79.9	D	63-66.9
B+	87-89.9	C	73-76.9	D-	60-62.9
B	83-86.9	C-	70-72.9	F	< 60

CLASS ATTENDANCE:

Attendance at all sessions is mandatory. A part of your grade is dependant upon it (1% per class period missed). All absences must be excused. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

If you must be absent, please contact me at my office number or leave a message on my phone mail prior to the class meeting. If you must miss a class when a quiz is given, you may make it up if you call ahead and have a legitimate excuse. If you do neither, your score will be 0 for that quiz.

GENERAL POLICIES:

Student Dignity

The University expects all students and employees to conduct themselves with dignity and respect for students, employees, and others. It is each individual's responsibility to behave in a civil manner and make responsible choices about the manner in which they conduct themselves. Harassment of any kind is ***not acceptable*** at Ferris State University. The University does not condone or allow harassment of others whether engaged in by students, employees, supervisors, administrators, or by vendors or others doing business with the University.

Harassment is the creation of a hostile or intimidating environment in which verbal or physical conduct, because of its severity or persistence, is likely to significantly interfere with an individual's work or education, or adversely affect a person's living conditions.

To assist with the understanding of what harassment is, this policy contains specific definitions of two of the more prevalent types of harassment – racial harassment and sexual harassment.

Harassment

Racial harassment includes any conduct, physical or verbal, that victimizes or stigmatizes an individual on the basis of race, ethnicity, ancestry, or national origin. Such behavior could involve
verbal conduct, intentional or otherwise, that has the purpose or effect of (or explicitly or implicitly threatens to) interference with an individual's personal safety, academic efforts, employment, or participation in University-sponsored activities.

The attributes of racial harassment described above are also the attributes of most other types of harassment that can occur. Harassment may be based upon a person's status that is protected by law (i.e., religion, veteran status, handicap, etc.), or may be for some other reason not specifically covered by law. In any event, harassment of any type is ***not acceptable*** at Ferris State University.

Sexual Harassment

Using the definition contained in the Equal Employment Opportunity Commission guidelines, adapted to include educational environments, sexual harassment is defined as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) submission to such conduct is made either explicitly or implicitly term or condition of an individual's employment or academic advancement;
2) submission to or rejection of such conduct by an individual is used as a factor in employment or academic decisions affecting such individuals;
3) such conduct has the purpose or effect of substantially interfering with an individual's work or academic performance, or creating an intimidating, hostile, or offensive working, living, or academic environment.

While sexual harassment most often takes place in situations of power differential between the persons involved, sexual harassment may also occur between persons of the same status, e.g., student-to-student. The person exhibiting sexually harassing conduct need not realize or intend the conduct to be offensive for the conduct to constitute sexual harassment.

Harassment Concerns

Any person who believes he or she has been subjected to harassment of any kind (sexual, racial, or otherwise) should approach the individual whom they believe is responsible. He or she should identify the specific behavior, explain that he or she considers the behavior to be offensive and/or harassing, and ask the individual to stop the behavior. If assistance is needed to approach the individual, contact either an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, or the Director of Affirmative Action.

If approaching the individual is not possible (i.e., you are uncomfortable or uncertain as to how the situation should be handled or concerned the situation may become volatile) or does not resolve the matter, it should then be reported immediately to an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, the Director of Student Judicial Services, or the Director of Affirmative Action. If, for some reason, you are uncomfortable discussing your situation with any of these individuals, please report your situation to any member of University administration. The circumstances surrounding the matter will be fully investigated, including the nature of the harassment and the context in which it occurred.

All reports of harassment and subsequent investigations will be kept as confidential as possible. Anyone found to have violated this Policy will be subject to discipline up to and including discharge and dismissal that may include, but not be limited to, official reprimand, official apology, sensitivity training, and/or other disciplinary action including dismissal. Likewise, because intentionally false accusations of harassment can have serious effects on innocent people, anyone found to have intentionally falsely accused another person of violating this Policy will be subject to discipline up to and including discharge or dismissal.

Disruptive Behavior Policy Statement

The College of Allied Health Sciences strives to maintain a positive learning environment and educational opportunity for all students. Consequently, patterns of behavior which obstruct or disrupt the learning environment of the classroom or other educational facilities will be addressed.

1. The instructor is in charge of the course. This includes assignments, due dates, methods and standards of grading, and policies regarding attendance, tardiness, late assignments, outside conferences, etc.
2. The instructor is in charge of the classroom. This includes the times and extent to which they allow questions or discussion, the level of respect with which they and other students are to be treated, and the specific behaviors they will allow within their classes. Open discussion of an honest opinion about the subject of a course is encouraged, but the manner in which the class is conducted is a decision of the instructor.
3. If a student persists in a pattern of recurrent disruptive behavior, then the student may be subject to administrative action up to and including an involuntary withdrawal from the course, following administrative review by the Allied Health Sciences Dean's Office, and/or University disciplinary proceedings.

4. Disruptive behavior cannot be sanctioned by a lowered course grade (e.g., from a B to a C) except insofar as quality of classroom participation has been incorporated into the instructor's grading policy for all students. (Note: Academic misconduct, which is covered by other regulations, can be a legitimate basis for lowering a grade or failing the student.)
6. Students as well as employees are bound by the University's policy against harassment in any form. Harassment will not be tolerated.
7. The office of the student's dean will be notified of any serious pattern or instance of disruptive behavior.

Honesty Policy

The purposes of this policy are to encourage a mature attitude toward learning to establish a sound academic morale, and to discourage illegitimate aid in examinations, laboratory, and homework.

Cheating is defined as using or attempting to use, giving or attempting to give, obtaining or attempting to attain, products or prepared materials, information relative to a quiz or examination or other work that a student is expected to do alone and not in collaboration with others. Plagiarism (copying) of themes or other written work shall also be considered an infraction.

Students are required to present the results of their own work except under circumstances in which the instructor may have requested or approved the joint effort of a number of students.

The penalty for the first offense of willful cheating consists of the student receiving a zero for the assignment in which the infraction occurs. However, cheating on quizzes or examinations means failure in the course. The student may appeal the decision to the Disciplinary Committee.

Further offenses may result in suspension or dismissal from the University.

DATE	SUBJECT
8/30	Introduction to the Course
9/6	No Class – Labor Day
9/13	CLS Curricula
9/20	Medical Laboratory Personnel
9/27	Medical Laboratory Personnel
10/4	Medical Laboratory Personnel
10/11	Departments in a Clinical Laboratory
10/18	Departments in a Clinical Laboratory **Quiz #1**
10/25	Professional Organizations
11/1	Professional Organizations/Licensure
11/8	**Mecosta County General Hospital Visit**
11/15	**Mecosta County General Hospital Visit**
11/22	Employment Opportunities
11/29	Medical Ethics (**Hospital Visit report due; Sim Lab report due**)
12/6	**Quiz 2 (Literature Review Report Due)**

Article Reports

Your assignment is to write a review of 2 articles of interest (to you) about or concerning issues of the clinical laboratory. Use **2 of the 3** major CLS periodicals available in FLITE:

Laboratory Medicine *Clinical Laboratory Science* *MLO (Medical Laboratory Observer).*

Select your articles after you have read several, or use the year-end index in each (December Issues) and pick a subject area of interest and look up the articles in previous issues. You should also browse through the periodicals to see the type of forums, editorials and general format present each month.

Write a short summary of the articles to include:

1. Type of article this is (report, research, case study)
2. Summary of the results of any studies performed
3. Summary of the conclusions of the study or discussion
4. Describe journal structure including: ads, forums, general articles, and departments

You should be able to include all of the above in a less than 1 page for each article. Start the second summary article on a new page. The report is to be typed or printed using a word processor and should include a title page and be double-spaced.

Many terms in the articles may be unfamiliar, so be sure to have a medical dictionary available (you should buy one anyway, if you plan to stay in a health career). You may certainly quote the article, but be sure to cite the reference properly. Use the format used by the periodical itself to cite the reference.

The title page should include:

Your Name
Date
"Title of the Article #1"
Journal Name, Volume # and Date
Author(s) of the article
"Title of the Article #2"
Journal Name, Volume # and Date
Author(s) of the article

Evaluation of your report will be based on the following:

10 pts - Cover sheet
50 pts - Content (completeness and relevance to the assignment)
10 pts - Properly cited references
10 pts - Grammar
10 pts - Spelling
10 pts - Logical sequence of the paper

This paper is due at the last class meeting on Dec 1. I will review rough drafts of your papers if you get them to me before Oct 27. Computers with word processing software and printers are available in the College of Allied Health Science building as well as in many computer labs on campus. Lab hours are posted and include some evening hours.

Laboratory Visit Report

You will be visiting the Mecosta County General Hospital Laboratory as part of this course. You may also visit a hospital laboratory in your hometown or any other lab that you wish. You must write a short report about one of these laboratories. The purpose of this assignment is to help you clarify what CLS is all about.

The report should include all of the following :

	Your Name CLLS 101 Date of Visit Lab Manager Name
Create Your Own Title	10 pts
Describe your visit. Be sure to include:	
• the departments you visited.	15 pts
• the function of each department	15 pts
• what you observed in each department.	10 pts
• what instruments were being used.	10 pts
• what the instruments were measuring.	10 pts
• your feelings (concerns, emotions, etc) about what you observed.	10 pts
• attending the visit	20 pts

Review the list above before the visit. Take short notes during your visit and write down as much as you can remember soon after the visit. You can't possibly remember everything. A few sentences or a paragraph about each laboratory area will suffice. Don't forget to discuss how you felt about what you saw.

Simulated Laboratory Visit Report

All students will also be required to visit the Simulated Laboratory beginning Oct 5th. Sim lab meets T-R 14:00 – 17:50 in rooms 421 and 423. You will be required to sign up for a 1 hour block of time for the visit. You will also be required to write a 1-2 page summary of your visit.

CLLS 101

Orientation to Clinical Laboratory Sciences

Course Objectives

Upon completion of the CLLS 101 course, the CLS student will be able to:

A. **Functions of Laboratory Tests**

1. Define Clinical Laboratory Science
2. State three functions of laboratory testing
3. Explain how physicians use information from the clinical laboratory

B. **Curriculum**

1. Discuss the requirements of the CLS curriculum (MLT or MT) including:

   a) Chemistry courses
   b) Biology courses
   c) Mathematics course
   d) Professional courses
   e) Elective courses

2. Discuss the major differences between the MLT and MT curricula
3. State the purpose of the MLT/MT Career Mobility Program and explain how it differs from the Integrated MT program
4. Define the clinical experience in the FSU program and discuss its purpose
5. Discuss the process of placement of students in the clinical experience
6. Discuss the major requirements of the CLS policy on student progression
7. Explain why it is necessary for CLS students to be immunized for the Hepatitis B virus.

II. Personnel in the Laboratory

A. List the major job classifications in the clinical laboratory and discuss the educational requirements and job responsibilities for the following personnel:

1. pathologist
2. administrative technologist
3. medical technologist (CLS)
4. medical laboratory technician (CLT)
5. clinical laboratory assistant
6. laboratory aide/phlebotomist
7. histotechnologist
8. cytotechnologist

B. Construct a simple organization chart of the employees in a typical clinical lab

III. Departments of the Clinical Laboratory

A. List the major departments/sections found in a typical clinical laboratory:

1. Blood Bank (Immunohematology)
2. Microbiology
3. Hematology
4. Serology/Immunology
5. Coagulation
6. Urinalysis/Body Fluids
7. Clinical Chemistry
8. Histology/cytology

B. Discuss one major testing system found in each department

IV. Employment Opportunities

A. State at least 5 possible career opportunities other than a clinical laboratory staff technician or technologist available to a CLS graduate including:

1. Hospital / Medical Center: Laboratory Areas
2. Health Care Agency/Government
3. Health Care Administration
4. Education
5. Humanitarian Work
6. Professions
7. Industry
8. Laboratory Information Systems

B. State the expected current starting salary ranges for MLT and MT graduates at career entry level

C. Visit a modern clinical laboratory and a simulated clinical laboratory. A paper will be written of the observations of the students in these laboratories

V. Professional Organizations

A. Define and differentiate the following terms:

1. Certification
2. Accreditation
3. Registration
4. Licensure

B. State what each of the following abbreviations stands for and state the major function of each organization

1. ASCLS
2. AMT
3. CAP
4. ASM
5. ASCP
6. NCAMLP
7. AABB
8. CLMA
9. AACC
10. NAACLS

VI. Professionalism and Medical Ethics

A. Define ethics and professionalism
B. List and explain the professional responsibilities of clinical laboratory personnel to:
   1. the patient
   2. the physician
   3. employing institution
   4. laboratory co-workers
   5. the profession
   6. other members of the health care team

C. Given a workplace situation involving the groups listed above, explain how you would respond.

VII. Professional Literature

A. Locate and preview articles of interest from professional periodicals
B. Write a summary of an article found in professional periodicals

CLLS 121: Introduction to Specimen Collection
Fall, 2005

I. Course Information

A. **Meeting Time:** Section AGA: T 1700 – 1850, location TBA
Section 001: T 1700 – 1850, VFS 420
Section 002: R 1800 – 1950, VFS 420
B. **Credit Hours:** 2
C. **Course Configuration:** 2 + 0
D. **Course Description:** An introduction to the knowledge and behaviors required to collect, process and transport specimens of blood used for laboratory analysis.
E. **Prerequisites:** None

II. Instructor:

A. Office:
B. Office Phone:
C. E-mail:
D. Best time to contact the instructor:

III. Required books:

A. **Garza, Diana and Becan – McBride, Kathleen.** Phlebotomy Handbook: Blood Collection Essentials, 7th Edition. Pearson Prentice Hall, 2005.
B. **Ross, B.** CLLS 122 Course Manual.

Why Garza and Becan – McBride? Because it covers most of the content of this course, covering not only blood collection, but processing blood and other laboratory specimens. It has a CD for additional practice and information.

Why Ross? Because it has the chapter outlines and class exercises you need.

IV. **Course goals:** In keeping with the CLS program goals, listed in the CLS Student Handbook, goals for this course are to provide you, the student, with opportunities to:

A. Integrate theory and practice, especially in problem – solving.
B. Demonstrate understanding of the importance of specimen collection in the delivery of patient care.
C. Demonstrate knowledge of collection equipment, special precautions, and substances that can interfere in the clinical analysis of blood and body fluids.
D. Demonstrate understanding of test ordering, specimen transport, and specimen processing.
E. Apply quality assurance practices to specimen collection.
F. Demonstrate knowledge of professional behaviors, and demonstrate professional behaviors by adhering to the course attendance policies.
G. Communicate effectively and appropriately.

V. **Instructional methods:** Question and answer, discussion, role play.

VI. **Course requirements:** Come to class, be on time, work hard, and maintain a positive attitude!

VII. Resources, references, supplies:

A. **Web resources:** Some web resources you may want to visit include

1. The Center for Phlebotomy Education: at www.phlebotomy.com This includes a free newsletter that you can sign up for.
2. Lab Tests Online: an award – winning site where you can get information about lots of lab tests, explained in plain English. www.labtestsonline.org
3. WebMD: lots of general health care information. www.webmd.com
4. Ferris CLS program: www.ferris.edu/cls

B. **Supplies:** You'll need a lab coat, name tag (we'll supply one for you), and a black indelible marker.

C. Bring your books to class EVERY TIME!

VIII. Grading and evaluation:

		Points	**% of grade**
Quizzes	4 @ 50	200	54%
Attendance	14 @ 5	70	19%
Final Exam	100	100	27%
Total		370	100%

The standard grading system of the CLS programs will be used.

Level of comprehension expected: You'll be expected to apply your new knowledge to the kind of situations you may encounter in the workplace. You'll get lots of practice, and then move on to real people!

Don't give up if you have problems – you'll never get to the point where you know everything. Keep learning, develop an approach that works for you, and you'll be amazed at how competent you become!

IX. Attendance requirements:

A. **College Policy:** The faculty of the College of Allied Health Sciences adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into

individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. Clinical Laboratory Sciences Attendance Policy:

Attendance will be taken in this course. You need to acquire all the skills and learn all the information. YOU NEED TO BE HERE. CLLS 122 and 123 are the only opportunities that the program faculty have to determine that you are responsible enough to attend as scheduled. If coming to CLLS 122 and 123 is a problem, then you will have difficulty attending CLLS 191, and we may reserve the right not to assign you to an internship site.

If you must be absent, telephone IN ADVANCE TO THE NUMBER YOUR INSTRUCTOR PROVIDES and leave a message. If you don't do this, the instructor will assume that you are absent because you're not interested, and you won't get to make up the work you missed.

Acceptable reasons for missing class include illness, weather emergency, death in the family, required court appearances, and trips made by you as a varsity athlete. If you have some other situation, discuss it with the instructor in private.

X. **Additional information:** If you have a disability that would make it difficult to complete the objectives for this course, talk to your instructor RIGHT AWAY. We'll do what we can to help.

XI. CLLS 122 Tentative Class Schedule
Fall, 2005

Date	Class	Reading Assignment
0830 0901	Phlebotomy Practice and Quality Essentials	Chapter 1
0906 0908	Infection Control	Chapter 5
0913 0915	Safety and First Aid	Chapter 6
0920 0922	**Quiz 1** Blood Collection Equipment	Chapter 8
0927 0929	Venipuncture Procedures	Chapter 9
1004 1006	Venipuncture Procedures	---
1011 1013	The Cardiovascular System	Chapter 4
1018 1020	**Quiz 2** Ethical, Legal, and Regulatory Issues	Chapter 2
1025 or 1027	Chapter 10: Procedures for Collecting Capillary Blood Specimens	Chapter 10
1101 1103	Preanalytic Complications in Blood Collection	Chapter 11
1108 1110	Documentation, Specimen Handling and Transportation	Chapter 7
1115 1117	**Quiz 3** Forensic Toxicology, Workplace Testing, Sports Medicine, and Related Areas	Chapter 16
1122 1124	**Thanksgiving Week: No Class**	---
1129 1201	Urinalysis, Body Fluids, and Other Specimens	Chapter 15
1206 1208	**Quiz 4** Pediatric Procedures Elderly, Home, and Long Term Care Collections	Chapters 12 and 14
1213 1215	**Final Exam**	

Course Objectives

Upon completion of these units, the student should be able to score of 70% or higher on quizzes and examinations. The student should also be able to demonstrate the knowledge needed to meet the objectives of CLLS 123.

Section I: Phlebotomy Practice

Unit A: Phlebotomy Practice

1. Define phlebotomy.
2. Identify the various health professionals who perform phlebotomy and related procedures.
3. List professional competencies for phlebotomists, including knowledge, skills and behaviors needed for professional practice.
4. List skills for active listening and effective verbal communication with patients, other health professionals, coworkers, and the public.
5. List examples of positive and negative body language.
6. Describe health care settings where phlebotomy services are routinely performed.
7. Describe examples of how a phlebotomist may participate in quality improvement practices, including gathering data, analyzing data and implementing improved practices.

Unit B: Ethical, Legal, and Regulatory Issues

1. Define basic ethical and legal terms.
2. Explain how ethical and legal issues may differ, using examples from phlebotomy practice.
3. Define informed consent and how it applies to phlebotomy practice.
4. Describe how to avoid litigation as it relates to phlebotomy practice.
5. Identify key elements of the Health Insurance Portability and Accountability Act (HIPAA) and how it applies to phlebotomy practice.

Section II: Safety and Infection Control

Unit A: Safety

1. Define the following terms, and apply them to health care:

    a. Cardiopulmonary resuscitation (CPR)
    b. Environmental Protection Agency (EPA)
    c. Material Safety Data Sheet (MSDS)
    d. Occupational Safety and Health Administration (OSHA)

2. Discuss the importance of safety awareness for health care workers.

Unit A: Safety, continued:

3. Explain procedures for safety in a health care facility, including:

    a. Fire safety
    b. Electrical safety
    c. Radiation safety
    d. Mechanical safety
    e. Chemical safety

4. Describe a disaster emergency plan for a health care facility, and how the phlebotomist may be involved in the plan.
5. Explain safety policies and procedures for phlebotomy practice, including specimen collection, transport, and processing.
6. Describe the safe use of safety equipment, including fire extinguishers, safety showers, eyewash stations, telephone, and other equipment as assigned.
7. List precautions that can reduce the risk of patient injury.

Unit B: Infection Control

a. Define the following terms, and apply them to phlebotomy practice:

    a. Antiseptics
    b. Centers for Disease Control and Prevention (CDC)
    c. Disinfectants
    d. Double bagging
    e. Fomites
    f. Hand hygiene
    g. Infection control
    h. Isolation procedures
    i. Mode of transmission
    j. Nosocomial infection.
    k. Protective (Reverse) Isolation
    l. Standard precautions
    m. Sterile technique

b. Identify basic procedures for infection control, and describe how they are applied to phlebotomy practice.
c. Describe correct techniques for:

    a. Hand washing
    b. Putting on and removing personal protective equipment.
    c. Double bagging
    d. Entering and exiting various patient isolation sites.

4. Identify potential routes of infection and methods for preventing transmission of infective agents via these routes.

Unit B: Infection Control, continued:

5. Identify steps the phlebotomist can take to avoid transmitting blood borne pathogens.
6. Describe various isolation procedures and reasons for their use.

Section III: The Cardiovascular System

1. Define the following terms, and relate them to the practice of phlebotomy:

a. ABO blood group system
b. Aorta
c. Artery
d. Arteriole
e. Atria
f. Basilic vein
g. Basophil
h. Blood
i. Blood pressure
j. Blood vessel
k. Capillary
l. Cardiovascular system
m. Cephalic vein
n. Circulatory system
o. Coagulation
p. Diastolic pressure
q. Eosinophil
r. Erythrocyte (RBC)
s. Fibrin
t. Fibrinolysis
u. Granulocyte
v. Hematocrit
w. Hemoglobin
x. Hemostasis
y. Leukocyte (WBC)
z. Lymphocyte
aa. Median Cubital Vein
bb. Monocyte
cc. Neutrophil
dd. Plasma
ee. Platelet
ff. Pulmonary Circulation
gg. Serum
hh. Systolic Pressure
ii. Tunica externa
jj. Tunica interna
kk. Tunica media
ll. Vasoconstriction
mm. Vein
nn. Venae cavae
oo. Ventricle
pp. Venule

2. Identify and describe the structures and functions of the heart.
3. Trace the flow of blood through the cardiovascular system.
4. Identify and describe the structures and functions of different types of blood vessels.
5. Identify and describe the cellular and non cellular components of blood.
6. Locate and name the veins most commonly used for phlebotomy procedures.

Section IV: Equipment for Specimen Collection

1. Define the following terms, and relate them to the practice of phlebotomy:

a. Anticoagulant
b. Antiseptic
c. Latex allergy
d. Needle gauge
e. Sodium fluoride

Section IV: Equipment for Specimen Collection, continued:

2. List the various anticoagulants used in blood collection, including their mechanisms for preventing blood from clotting.
3. Correlate the various collection tube stopper colors with the anticoagulants in objective #2 above.
4. Identify phlebotomy supplies and equipment, listing what should be available to the phlebotomist when blood collection is performed.
5. Identify the supplies and equipment needed to perform capillary punctures.
6. Describe the various safety features of current venipuncture equipment.
7. Describe special precautions taken when transporting blood samples from the venipuncture site to the laboratory.

Section V: Collecting Patient Specimens

A. Venipuncture

1. Outline a process for correct identification of patients before phlebotomy is performed.
2. List the supplies needed for a routine phlebotomy procedure.
3. Outline methods for hand hygiene.
4. Identify the most appropriate sites for venipuncture, including alternative sites.
5. Describe actions that may be taken when primary venipuncture sites are not available.
6. Describe the process for applying a tourniquet to the patient's arm, including time limits.
7. List the sequence of steps for a venipuncture procedure.
8. Describe the decontamination process for skin and list the agents usually used for these procedures.
9. Describe the current "order of draw" when multiple tests are ordered.
10. Given a list of tests ordered for a patient, list the tubes needed and the correct order of draw for that patient.
11. Explain the purpose of timed samples, and the importance of drawing the samples on time.
12. Define the terms "fasting", STAT, ASAP, and other terms applied to phlebotomy procedures.

C. Capillary Puncture

1. List reasons for acquiring capillary blood specimens.
2. Identify the correct sites for performing skin puncture on newborns, children, and adults.
3. Explain why it is important to control the depth of the puncture.
4. Explain why capillary blood from a skin puncture is different from blood collected by venipuncture.
5. Describe the procedure for making a blood smear.

Section VI: Specimen Integrity

Unit A: Preanalytical Complications in Blood Collection

1. Describe preanalytical complications related to phlebotomy procedures.
2. Explain how to prevent complications in blood collection.
3. Explain how to handle complications in blood collection.
4. List at least five factors about a patient's physical condition that might affect blood collection.
5. List examples of substances that can interfere with laboratory analysis.
6. Describe methods used to prevent interference with laboratory analyses.

Unit B: Documentation, Specimen Handling, and Transportation

1. Describe the components and uses of a patient record, and relate the patient record to phlebotomy and laboratory analysis.
2. Describe acceptable guidelines for maintaining patient privacy and the confidentiality of medical information.
3. Describe the essential elements of laboratory requisition and report forms.
4. Name and describe three methods commonly used to transport specimens to a laboratory for analysis.

Unit C: Urinalysis, Body Fluids, and Other Specimens

1. Identify body fluids other than blood that are analyzed in the clinical laboratory.
2. For the body fluids listed in objective #1, describe correct procedures for collecting and transporting the specimens.
3. Identify specimens collected for throat, nasopharyngeal, and other microbiological cultures and the protocols that must be followed when transporting these specimens.
4. List the types of patient specimens that are needed for gastric and sweat chloride analysis.
5. List three types of urine specimen collections and differentiate the uses of the urine specimens obtained from these collections.

Section VII: Patient Issues in Phlebotomy

Unit A: Forensic Toxicology, Workplace Testing, Sports Medicine, and Related Areas

1. Define toxicology and forensic toxicology.
2. List five specimens that may be used for forensic testing.
3. Describe the role of the health care worker in federal drug – testing programs.
4. Define chain of custody.
5. Explain the use of a chain of custody and describe a Custody and Control Form.
6. List examples of where drug testing may be useful and valuable.
7. Describe how adulterated urine specimens can be detected.

Unit B: Pediatric Procedures

1. Describe fears and concerns of children in different phases of development may have toward the blood collection process.
2. Describe appropriate parent and health care worker behaviors during pediatric blood collection.
3. Identify puncture sites for a heel stick on an infant.
4. Describe the steps in a heel stick of an infant.
5. List venipuncture sites for infants and small children.
6. Discuss the types of equipment available for specimen collection from children.
7. Outline the procedure for specimen collection for neonatal metabolic screening tests.

Unit C: Elderly, Home, and Long – term Care Patients

1. Describe point of care laboratory testing.
2. Identify analytes that can be measured with POCT.
3. Describe the most widely used application of POCT.
4. Describe the quality assurance requirements of POCT.
5. Define physical and emotional changes that are associated with the aging process.
6. Describe how a health care worker should react to physical and emotional changes associated with the elderly.

CLLS 191: Clinical Experience in Phlebotomy
Summer, 2005

I. **Course Information**

A. Meeting time: To be arranged with the clinical site. Refer to the CLS Programs attendance policy, at ***http://www.ferris.edu/cls/handbook/clinicalattend.html***.

B. Location: An affiliated clinical laboratory, as assigned.

C. Credit hours: 4

D. Course configuration: 0 + 40

E. ***Course description:*** A supervised experience in a variety of health care settings where the student can practice previously acquired skills in specimen collection, transport, and processing.

F. Prerequisites: CLLS 121 with a grade of C or better

II. **Instructor:** Daniel P deRegnier MS, MT(ASCP)

A. Office: VFS 408

B. Office phone: 231.591.2327

C. E-mail: ***deregnid@ferris.edu***. For course related communications, please use the e-mail function within WebCT.

D. Office hours: 11:30 – 112:20 M-R

III. **Required books:** None. Purchase and use of a review book for phlebotomy certification examinations is highly recommended.

IV. **Course objectives:** Refer to CLLS 191 in your WebCT link.

V. **Course goals: In keeping with the CLS program goals listed in the CLS Student Handbook, goals for this course are to provide you, the student with opportunities to:**

A. Practice laboratory safety, applying your knowledge of blood borne pathogens, chemical hygiene, and laboratory safety policies.

B. Develop technical competence through guided practice in a laboratory setting.

C. Integrate theory and practice.

D. Evaluate the suitability of samples submitted for testing.

E. Apply quality assurance practices to phlebotomy.

F. Practice professional behaviors, including maintaining the confidentiality of patient results, neatness in work habits, performing to the best of your abilities, following established program and laboratory policies, and assuming responsibility for your own learning.

Course Goals, continued:

G. Incorporate your course work into daily practice in the clinical laboratory.

H. Be evaluated fairly based on your skills, knowledge, and performance.

I. Work as a member of a health care team, focusing on patient care.

J. Practice maintaining professional competence under the normally stressful conditions of the laboratory.

K. Be aware of the impact of external regulatory requirements, such as those of CLIA 88, OSHA, HIPAA, and NAACLS, and to comply with those requirements.

L. Correlate results from all areas of the laboratory and relate these results to the clinical condition of the patient.

VI. Instructional methods: Guided practice, under the supervision of designated clinical laboratory science professionals.

VII. Course requirements: Each student is expected to comply with the policies of the Clinical Laboratory Science programs, as well as the policies and procedures of the clinical site. Refer to Part IV of the Clinical Laboratory Sciences Student Handbook **at** http://www.ferris.edu/cls/handbook/clinicalexperience.html.

VIII. Grading and evaluation: Your grade for this course will be 60% based on your laboratory skills and 40% on exam scores. Go to the CLLS 191 homepage on WebCT. There you will find a clinical skills checklist for each laboratory section (as well as access to the exams). You can check your grade as you go along.

IX. Attendance requirements: You must follow the attendance policies of the clinical site, as well as those of the CLS programs. Refer to **http://www.ferris.edu/cls/handbook/clinicalattend.html.** The clinical coordinator at your designated site will provide a specific schedule of your rotations.

CLLS 215: Clinical Chemistry 1
Summer, 2005

I. General Course Information

A. **Meeting times and locations:**

1. **Dates:** June 15 – August 10, 2005
2. **Class:** M 1200 – 1335, VFS 425
   TR 0800 – 0935, VFS 425
3. **Lab Section 211:** TR 1230 – 1435, VFS 423
4. **Lab Section 212:** WF 1230 – 1435, VFS 423

B. **Credit Hours:** 4

C. **Course Configuration:** 3+3, adjusted to fit into summer term format

D. **Course Description:** Introduction to theories, procedures, calculations, and instruments in clinical chemistry.

E. **Prerequisites:** CHEM 214 and BIOL 205 or equivalent.

II. **Professor:** Barbara Ross MS, MT(ASCP) **Office:** VFS 303
Phone: 231.591.2317 **Office hours:** 0900 – 1050 MW
Email: ROSSB@FERRIS.EDU

III. Required Textbooks (3)

A. Ashwood, ER, and Burtis, CA. Tietz Fundamentals of Clinical Chemistry, 5th edition, WB Saunders, 2000. Barnes and Noble list price: $79 (new).

Why this book? It is THE clinical chemistry book, and has been for years. (Mrs. Ross has a second edition!) You will use this in CLLS 215, CLLS 335, CLLS 440 and CLLS 465, PLUS your clinical chemistry internship. BUY IT! KEEP IT! READ IT! There is lots of very useful information in it!

B. Doucette, LJ. Mathematics for the Clinical Laboratory, WB Saunders, 1997. Barnes and Noble list price: $37 (new).

Why this book? Everybody who works in the clinical lab has to do "lab math" sometimes, and most people dread it. So it's a good idea to have a source of information to refer to when you need to make a solution or correct for a diluted sample. There's a chapter on spectrophotometry math, and a couple on statistics, and even chapters on hematology math and urinalysis math! We'll use it a lot in this course, and in other courses, as well. Hang onto this one, too.

C. Ross, Barbara. CLLS 215 Laboratory Manual. Available at Lundberg Bookstore. Probably about $10.

Why this book? It's the lab procedures you'll need. If you continue in the program and take CLLS 335, you'll need the procedures for them, too.

IV. Course Goals and Objectives

A. **Goals:** In keeping with the CLS program goals, found in the CLS Student Handbook, goals for this course are to provide you with opportunities to:

1. Practice safe laboratory procedures, applying knowledge of blood borne pathogens and chemical hygiene.
2. Evaluate the suitability of samples submitted for testing.
3. Perform tests for common analytes in serum, plasma, urine, and other body fluids, using a variety of instruments and techniques.
4. Distinguish between standards, calibrators, controls, blanks, and explain the purpose of each.
5. Perform and interpret quality control tests, and validate results before reporting.
6. Operate and perform routine maintenance on many clinical chemistry instruments.
7. Correlate clinical chemistry test results to human physiology and disease processes, including correlation with results from other laboratory sections, and review and application of basic concepts of human metabolism and pathology.
8. Practice professional behaviors, including maintaining confidentiality of patient data, neatness in work habits, performing to the best of your abilities, following established program policies, and assuming responsibility for your own learning in this course.

B. **Objectives:** Specific course objectives are included later in this syllabus.

C. What will you learn?

Clinical chemistry is the busiest area of the clinical laboratory. It is also the most automated. You'll begin by performing manual spectrophotometric procedures. You're doing the same procedures as the instruments, and using the same kind of electrical readings to calculate concentrations of analytes. You need to understand the processes going on inside the big automated boxes. You also need to know how clinical chemistry techs assure accuracy and precision in their testing. When you've had some practice, you'll begin using the big analyzers to produce a workload, doing several tests at once.

D. What does this have to do with your future?

You may work in clinical chemistry, so you need to know what goes on there. When the testing is automated, physicians, health care workers, and patients rely on the staff in clinical chemistry to interpret test results, to be sure the results are valid before they are reported, and to recommend and perform follow-up tests when a patient sample gives abnormal results. So in addition to running the tests, you need to learn what the results mean.

V. Nature of the course

A. How will this be taught?

Because there's so much content to cover, we'll move pretty fast. It's important that you come prepared and do the reading outside of class. The format will be mostly discussion, Q and A, and lecture. A tentative schedule is included later in this syllabus.

B. What about lab?

We'll begin with simple procedures, and work our way up to the automated instruments. A lab schedule is included later in this syllabus.

C. What do I have to do?

1. Come to class, pay attention.
2. Come to lab, do the work. Each lab will require you to do some testing, report some results, and answer some questions about the analytes you measured.
3. Complete the required safety training (and document it!) by Friday, June 2, 2004.
4. You will have occasional competency evaluations, mostly involving pipetting.
5. You will get **a different kind of lab math problem EVERY WEEK**. Bring your calculator.
6. There will be several quizzes. They are each worth 50 points.
7. For the last ten labs, you will work in groups, operating one instrument per week. Routine operation will involve daily maintenance and function checks, calibration, running controls and patients, and validating control results before reporting patient results.

VI. Course Requirements

A. Lab Reports and math problems

1. Turn in a lab report after each lab session. This will include the results you got for your testing, plus questions about reference (normal) ranges, and the clinical significance of results for those analytes.
2. Turn in a set of lab math problems (solved) whenever problems are assigned.

B. **Other lab requirements:** you must wear your lab coat, fastened, and your nametag. Bring a black marker and your calculator. Obey the safety rules.

C. Quizzes:

Each quiz will be worth **50** points. The quizzes will be primarily multiple choice and short answer. The specific course objectives to be covered on each quiz will be announced ahead of time. Most of each quiz will cover the material that is new since the last quiz. However, ALL QUIZZES can cover such cumulative information as how tests are performed and how QC relates to patient results. **THIS INCLUDES LAB MATH.**

D. Analyte assignments:

You'll be assigned to research 5 analytes: a protein, a hormone, a therapeutic drug, a toxin, and an enzyme. You'll be asked to provide specific information for each analyte. I'll compile everyone's information into big tables that you can print out and keep for study later.

E. Case of the week:

We'll begin each Thursday's class session with a short case study and some questions about it. You'll have to look up what you can about each case ahead of time. This will be discussed FIRST THING, so it's a way to be sure you're here and ready to go on time. If you turn it in at the beginning of the class with the questions answered correctly, you get 5 points.

If you turn it in late, but still during that class meeting, because you arrived late, you get 4 points. Late is any time after we begin discussing it.

If you turn it in after class, or after the discussion, you get no points.

VII. Resources, references, and supplies

A. **Web sites:** Some you may want to try are:

1. www.AACC.com (the site of the American Association of Clinical Chemistry, which features case studies and a "Question of the Day," among other things) and "Lab Tests Online," which explains about a lot of analytes.
2. www.Westgard.com , which teaches you about QC rules.
3. www.LabCorp.com, which is a large independent laboratory. Under Directory of Services, you'll find a lot of valuable information about how to measure just about any analyte.
4. http://www.leeds.ac.uk/medicine/teaching/clinsci/lscases/lsccindx.htm , which includes a number of case studies about people with various problems that can be diagnosed and monitored via clinical chemistry tests.
5. http://dwjay.tripod.com/conversion.html , a site that helps with unit conversion (you still have to know how to do this in case the www collapses!)
6. http://www.webmd.com/ , a source for information about the protein, hormone, drug, toxin, and enzyme that you'll be assigned to look up.
7. http://www.mclno.org/labpartners/chemistry.htm , a site for teachers and others who want to see what goes on in a "real" chemistry lab.

B. **Other readings:** If Tietz seems like too much to handle, there are other clinical chemistry books in cupboard U16 in VFS 423.

C. **Required supplies:**

1. Lab coat
2. Name tag
3. Indelible marker
4. Calculator
5. Three ring binder. **Get a big one.** You can put your lab manual in it.
6. One floppy disk, to save your Excel standard curve, and anything else you may want related to chemistry.

VIII. Evaluation

A. What will be graded?

Quizzes	8 @ 50	400	50.00%
Lab reports	16 @ 10	160	20.00%
Math skills	8 @ 10	80	10.00%
Pipette competency	2 @ 20	40	5.00%
Analyte assignments	5 @ 10	50	6.25%
Case of the week	7 @ 10	70	8.75%
Total		800	100.00%

The standard grading system of the CLS programs will be used. See the CLS Student Handbook at www.ferris.edu/cls/handbook/handbookhomepage.html

B. How will I be graded?

1. Lab reports: I'll look at the following:

   a. Did you do the assigned tests?
   b. Did you include the required controls, calibrators, and standards?
   c. Did you record/ report things correctly (units, significant figures, graphs labeled?)
   d. Did you answer the questions? Correctly?

2. Lab math problems

   a. Did you do the problems?
   b. Did you get the correct answer?

3. Quizzes: Did you get the correct answers, **working independently**?

4. Pipette competency

   a. Did you do the assigned task?
   b. Did you do it correctly?

5. Analyte assignment

   a. Did you do the assigned research?
   b. Did you turn it in on time?
   c. Was the information correct?

6. Case of the week

   a. Did you attempt to answer the questions?
   b. Did you turn it in on time?

B. Level of comprehension expected:

There will be some material to memorize. You must be able to APPLY your knowledge to specific situations. For example, I may give you a test result and ask you if it is within the reference range. If it is abnormal, I may expect you to correlate the result with possible disease states. And I will expect you to look at a list of results and pick out the ones that may be abnormal or inconsistent. This is the kind of knowledge you will use on the job.

IX. Attendance

A. **College Policy:** The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is

expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. **CLS Instructor attendance policy:**

I **will** take attendance in this course. You're learning techniques to use on the job. When you leave Ferris for clinical experience, the instructors will expect that you have learned these procedures, and the theory behind them. Therefore, I expect you to attend every class. I also expect you to be here ON TIME. Think of this as your job. If you must be absent, as with a job, telephone IN ADVANCE and leave a message. If you don't, I will assume that you are absent due to lack of interest, and are also not interested in making up the quiz or lab. It is time to be serious about your work.

C. **CLS promptness policy:**

Class begins at 0800 or 1200 and labs begin at 1230. I expect to see you present, with materials available, and ready to go. If you're not, expect to lose points for any assignment that you began late.

D. **If you must miss a lab or class**: telephone IN ADVANCE to the lab (231.591.2268) and leave a message.

E. **Acceptable excuses include:** illness, weather emergency (when the State Police recommends staying off the roads), death in the family, required court appearances, and trips made by you as a varsity athlete.

F. **Come to class.** Remember: you're paying to take this course. You might as well show up and get your money's worth.

G. **If you miss class with an excuse reported ahead of time:** See the instructor. I'll figure out a way for you to learn the content that you missed. If you missed lab, I'll have to schedule a time for you to make it up.

X. Guidelines for student conduct

A. Be on time and ready to start
B. Wear your lab coat, long pants, shoes with closed toes and heels, and your nametag.
C. Bring your calculator EVERY TIME. Forgetting it doesn't mean you don't have to calculate, it means YOU HAVE TO CALCULATE WITHOUT IT.
D. Clean up after yourself.
E. Cooperate.
F. Have fun, and learn all you can.

XI. General Course Policies: This course will follow the general policies of the University and the College of Allied Health Sciences.

A. ADA: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

B. Harassment: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

C. Religious Holidays: refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm for a copy of this policy.

D. Disruptive Student Policy: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

E. Plagiarism Policy: Plagiarism is a writer's use of someone else's words or ideas as his own without adequate and accurate acknowledgment of the source either copying word-for-word or paraphrasing or summarizing. Any instance of plagiarism will result in failing the course completely and may lead to referral to the department or university. (Just to demonstrate that we practice what we preach, we took this policy from the Department of Languages and Literature, the local experts. Refer to: http://www.ferris.edu/HTMLS/academics/Departments/langandlit/SYLE325.HTM.

CLLS 215: Clinical Chemistry 1
Summer, 2005 Tentative Class Schedule

Disclaimer: The instructor reserves the right to change the schedule of assignments, required material to be completed and/or read, dates assignments are due, and other course student responsibilities with the issuance of a notice with the affected changes and the date of implementation.

Date	Topic	Reading Assignments FOR TODAY
R 0616	Introduction; organization; Introduction to Spectrophotometry	Doucette: pp. 131 – 143 Tietz: SKIM pp. 57 – 70
M 0620	Spectrophotometry and variations	Tietz: pp. 71 – 73; 75 – 90
T 0621	**Quiz** How to Run A Chemistry Test; Introduction to Quality Control	Doucette: pp. 255 – 263; 265
R 0623	**Case of the week** Quality Control in Clinical Chemistry; Westgard rules	Doucette: pp. 277 – 296 Tietz: pp. 290 – 297
M 0627	**Analyte Report on Protein Due Today** Proteins	Tietz: pp. 326 – 328; 343 – 351 SKIM pp. 329 – 340
T 0628	**Quiz** Proteins and electrophoresis	---
R 0630	**Case of the week** Carbohydrates	Tietz: pp. 428 – 460
M 0704	**Fourth of July Holiday; no class**	---
T 0705	**Quiz** Carbohydrates; Non – protein nitrogen compounds	Tietz: pp. 415 – 426
R 0707	**Case of the week** NPN	---
M 0711	Immunoassays	Tietz: pp. 177 – 179; pp. 185 – 193
T 0712	**Quiz** Lipids	Doucette: pp. 163 – 164
R 0714	**Case of the week** **Analyte Report on Enzyme Due Today** Bilirubin and related molecules	Tietz: pp. 601 – 606
M 0718	Enzymes	Doucette: pp. 147 – 153
T 0719	**Quiz** Enzymes	Tietz: pp. 158 – 164; SKIM pp. 164 – 168; read pp. 169 – 176
R 0721	**Case of the week** Enzymes **Analyte Report on Hormone Due Today**	Tietz: Chapter 20: read about enzymes in the course outline
M 0725	Electrolytes	Doucette: pp. 160 – 163 Tietz: pp. 494 – 505 (note that there is also a chapter on electrochemistry, if you're really interested)
T 0726	**Quiz** Electrolytes	---
R 0728	**Case of the week** Acid – base **Analyte Report on Therapeutic Drug Due Today**	Doucette: pp. 159 – 160 Tietz: pp. 505 – 516
M 0801	Acid – base	---
T 0802	**Quiz** Endocrinology	Tietz: pp. 518 – 528

Date	Topic	Reading Assignments FOR TODAY
R 0804	**Case of the week** Thyroid Hormones **Analyte Report on Toxin Due Today**	Tietz: pp. 840 – 855 (note that there are lots of other chapters about different kinds of hormones)
M 0808	Therapeutic Drug Monitoring	Tietz: pp. 609 – 616; SKIM pp. 616 – 635
T 0809	**Quiz** Toxicology	Tietz: SKIM pp. 637 - 678

CLLS 215: Clinical Chemistry 1 Summer, 2005 Tentative Lab Schedule

Disclaimer: The instructor reserves the right to change the schedule of assignments, required material to be completed and/or read, dates assignments are due, and other course student responsibilities with the issuance of a notice with the affected changes and the date of implementation.

Date	Tasks	Lab Math topic	Competency	Points
W 0615 **R 0616**	Introduction to pipettes and Basic Lab Equipment			Lab: 10
F 0617	No lab	---	---	---
T 0621 **W 0622**	Pipettes/ Basic Lab Equipment; Introduction to Spectrophotometry	Spectrophotometry Math		Lab: 10 Lab Math: 10
R 0623 **F 0624**	Introduction to spectrophotometry			Lab: 10
T 0628 **W 0629**	Total protein, Albumin, CSF protein	Unit conversion		Lab: 10 Lab Math: 10
R 0630 **F 0701**	Protein electrophoresis		Glass Pipettes	Lab: 10 Competency: 20
T 0705 **W 0706**	Glucose/BUN/ cholesterol	% Solutions		Lab: 10 Lab Math: 10
R 0707 **F 0708**	Rotation			Lab: 10
T 0712 **W 0713**	Rotation	Molar Solutions		Lab: 10 Lab Math: 10
R 0714 **F 0715**	Rotation			Lab: 10
T 0719 **W 0720**	Rotation	Enzyme Math		Lab: 10 Lab Math: 10
R 0721 **F 0722**	Rotation		Micro Pipettes	Lab: 10 Competency: 20
T 0726 **W 0727**	Rotation	Osmolality/Anion Gap; Clearance Tests		Lab: 10 Lab Math: 10
R 0728 **F 0729**	Rotation			Lab: 10
T 0802 **W 0803**	Rotation	Dilutions		Lab: 10 Lab Math: 10

Date	Tasks	Lab Math topic	Competency	Points
R 0804 **F 0805**	Rotation			Lab: 10
T 0809 **W 0810**	Rotation	$V_1C_1 = V_2C_2$		Lab: 10 Lab Math: 10

Rotations: **Abbott AxSYM/ Abbott IMx/ Abbott TDx/ Beckman CX-7 and Osmometer/ Enzymes**

	Group 1	Group 2	Group 3	Group 4	Group 5
R 0707 **F 0708**	AxSYM	IMx	TDx	Cx7 and osmo	Enzymes
T 0712 **W 0713**	AxSYM	IMx	TDx	CX7 and osmo	Enzymes
R 0714 **F 0715**	IMx	TDx	CX7 and osmo	Enzymes	AxSYM
T 0719 **W 0720**	IMx	TDx	CX7 and osmo	Enzymes	AxSYM
R 0721 **F 0722**	TDx	CX7 and osmo	Enzymes	AxSYM	IMx
T 0726 **W 0727**	TDx	CX7 and osmo	Enzymes	AxSYM	IMx
R 0728 **F 0729**	CX7 and osmo	Enzymes	AxSYM	IMx	TDx
T 0802 **W 0803**	CX7 and osmo	Enzymes	AxSYM	IMx	TDx
R 0804 **F 0805**	Enzymes	AxSYM	IMx	TDx	CX7 and osmo
T 0809 **W 0810**	Enzymes	AxSYM	IMx	TDx	CX7 and osmo

CLLS 215: Clinical Chemistry 1
Course Objectives

Section I: Safety, Basic Laboratory Resources, and Laboratory Calculations

Upon completion of this section, the student will be able to:

Unit A: Safety

1. Apply knowledge of safe laboratory practice to all laboratory assignments.
2. Document chemical hygiene and blood borne pathogens safety training.
3. Correctly use equipment and procedures to assure safety, including, but not limited to:

    a. Disposable gloves
    b. Disinfectant cleaner
    c. Hand washing
    d. Laboratory coats

4. Leave centrifuges closed while running.
5. Dispose of glassware, contaminated samples, contaminated supplies, and other items correctly, as instructed.
6. Demonstrate or describe proper use of the following safety equipment, as assigned:

    a. Eye wash station
    b. Fire blanket
    c. Fire extinguisher
    d. Gloves
    e. Laboratory coat
    f. Safety glasses
    g. Safety shower

7. Distinguish between class A, B, and C fire extinguishers and describe use of each, as assigned.
8. Describe or demonstrate proper technique for cleaning up spilled chemicals, including concentrated acids, caustics, toxic compounds, and infectious agents, as assigned.
9. Locate and use appropriate MSDS sheets in the use, disposal, and cleanup of chemicals.
10. Develop laboratory techniques that consistently adhere to established safety practices.

Unit B: Laboratory Materials

1. Demonstrate knowledge of pipettes, to include:

    a. Identifying volumetric, serological, and semi-automated micropipettes
    b. Choosing the correct pipette for a given situation
    c. Using the pipettes correctly
    d. Distinguishing between TD and TC, as needed

2. Choose and use the correct type of glassware for a given application, to include:

    a. Identifying beakers, graduated cylinders, Erlenmeyer flasks, and volumetric flasks, as needed
    b. Choosing the correct beaker or flask for a given situation
    c. ALWAYS preparing reagents in volumetric flasks

Unit C: Laboratory Calculations and Laboratory Reagents

1. List the prefix, symbol, and decimal values of units in the metric system
2. Convert from one unit of the metric system to another, as assigned
3. Perform calculations converting temperatures of the Fahrenheit and Celsius systems, as assigned
4. Define % w/v, % w/w, and % v/v

Section I, Unit C, Laboratory Calculations and Laboratory Reagents, continued:

5. Express the concentration of a solution in units of % w/v, % w/w, or % v/v, as assigned
6. Calculate the desired weight of a substance if assigned to prepare a % solution.
7. Define molarity and calculate the molarity of a solution, the number of millimoles, or the desired weight of a substance.
8. Prepare a molar solution, as assigned.
9. Convert between molar and % solutions, as assigned.
10. Describe how to prepare an assigned dilution.
11. Prepare the dilution, as assigned.
12. Correct a laboratory result for dilution of the sample, as needed.
13. Calculate dilution folds and determine the tube dilution and substance (serum) dilution of any given tube in a serial dilution, as assigned.

Section II: Quality Assurance

Upon completion of this section, the student will be able to:

1. Differentiate between quality assurance and quality control.
2. Define standard, calibrator, and control, and explain how each contributes to the accuracy and/or precision of a laboratory analysis.
3. For an assigned analysis on assigned specimens, choose the correct matrix of control needed.
4. Define the following terms, and as assigned, calculate these parameters:

    a. Coefficient of variation
    b. Mean
    c. Median
    d. Mode
    e. Range of acceptable results
    f. Standard deviation
    g. Variance

5. Given data on a control sample, calculate the mean, standard deviation, and range of acceptable results.
6. Using the data calculated in #5 above, establish a Levy-Jennings chart to record future control results for that analyte, as assigned.
7. Plot control data on a Levy-Jennings chart, as assigned.
8. Using a Levy-Jennings, chart, recognize a trend and a shift.
9. Define the Westgard system of multi-rule quality control, including:

    a. 1_{2s} rule
    b. 1_{3s} rule
    c. 2_{2s} rule
    d. R_{4s} rule
    e. 4_{1s} rule
    f. 10_{x} rule

10. Given laboratory data, apply the Westgard multi-rule system to the data, as assigned, making correct decisions about acceptability of the results.
11. Explain how a multi-rule system contributes to good patient care by better distinguishing systematic from random error in laboratory testing.
12. Differentiate internal from external QC, and explain how each contributes to quality assurance.
13. Define a normal or reference range, and explain how variables in population can cause variation in the range.
14. Describe components of pre-analytical, analytical, and post-analytical variables and how they can influence the quality of laboratory results.

Section III: Laboratory Instrumentation

Upon completion of the following units, the student will be able to:

Unit A: Spectrophotometry

1. Define the following terms:

   a. Absorbance
   b. Bandwidth
   c. Linearity
   d. Percent transmittance
   e. Photometry
   f. Stray light

2. Describe the relationship between light transmittance and absorbance.
3. Convert absorbance to %T and %T to absorbance, as assigned.
4. Define the factors in Beer's Law.
5. Relate Beer's Law to the colorimeter formula.
6. Describe why each of the following must be present, for Beer's law to apply:

   a. Dilute solution
   b. Monochromatic light
   c. Transparent solution

7. Diagram the basic parts of a single-beam spectrophotometer, including: light source, monochromator, wavelength cuvette holder, photo detector, and readout device.
8. Explain the use of prisms, diffraction gratings, and filters to isolate wavelengths of light.
9. As assigned, measure the absorbance of a solution and prepare a spectral absorbance curve.
10. Demonstrate the use of a spectral absorbance curve to choose the best wavelength for a chemical analysis based on spectrophotometry.
11. Given standard solutions of known concentration, prepare a calibration curve, label it correctly, and use the calibration curve to determine the concentration of unknown samples.
12. Given one standard solution, use the colorimeter formula to calculate the concentration of unknown samples.
13. Use a previously prepared standard curve to determine the concentration of unknown samples, as assigned.
14. Describe the basic principles of operation of analyzers related to spectrophotometry, including:

    a. Atomic absorption spectrophotometry
    b. Flame photometry
    c. Fluorometry
    d. Nephelometry
    e. Reflectance photometry

Unit B: Automation

1. Define the following terms related to laboratory automation, as assigned:

   a. Batch analysis
   b. Discrete analysis
   c. Dwell time
   d. Random access
   e. Selective analysis
   f. Sequential analysis
   g. Simultaneous analysis
   h. Test menu
   i. Throughput

Section III, Unit B, continued:

2. Describe the stages of automated analysis, to include:

   a. Sample identification
   b. Specimen preparation
   c. Specimen delivery
   d. Specimen handling and transport
   e. Specimen processing
   f. Sample introduction and internal transport
   g. Reagent handling and storage
   h. Reagent delivery
   i. Chemical reaction phase
   j. Measurement of reaction
   k. Signal processing and data handling

3. As assigned, operate a variety of automated and semi-automated chemistry analyzers, including the CX-7, AxSYM, TDx, IMx, in order to obtain valid test results. Operation shall include calibration, controls, and routine and non-routine maintenance, as needed.
4. For the analyzers listed in #3 above, correctly apply the terms from objective #1.
5. For the analyzers listed in #3 above, explain how each accomplishes stages a – k of objective 2.
6. Define point of care testing and give examples of common point of care tests.

Section IV: Carbohydrates

Upon completion of this section, the student will be able to:

1. Define the following terms:

   a. Carbohydrate
   b. Diabetes mellitus
   c. Disaccharide
   d. Gluconeogenesis
   e. Glucose tolerance
   f. Glycation
   g. Glycogen
   h. Glycogenesis
   i. Glycogenolysis
   j. Glycolysis
   k. Hyperglycemia
   l. Hypoglycemia
   m. Insulin
   n. Ketone
   o. Monosaccharide
   p. Polysaccharide

2. List and describe the main classes of carbohydrates.

3. As assigned, describe the origin, method of action, and their effect on glucose levels of these hormones:

   a. ACTH
   b. Cortisol
   c. Epinephrine
   d. Glucagon
   e. Growth hormone
   f. Insulin
   g. Somatomedins
   h. Somatostatin
   i. Thyroxine

4. Describe the pathophysiology of hyperglycemia and hypoglycemia, and correlate laboratory results with these conditions.
5. Differentiate between type I, type II, and gestational diabetes with regard to prevalence, causes, age of onset, symptoms, and laboratory values.
6. Relate the guidelines of the American Diabetes Association to the diagnosis and monitoring of type I and type II diabetes.
7. Discuss the application of timed glucose measurements, such as the glucose tolerance test and 2-hour postprandial glucose to diagnosis of diabetes.
8. Discuss the application of glycated hemoglobin analysis to the monitoring of glucose metabolism.

Section IV, Carbohydrates, continued:

9. Discuss analytical procedures used in the measurement of glucose in:

    a. CSF
    b. Serum or plasma
    c. Urine

10. As assigned, measure glucose and glycated hemoglobin in the laboratory. For each analyte, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section V: Non Protein Nitrogen Compounds and Renal Metabolism

Upon completion of this section, the student will be able to:

1. Describe the function of the kidney in homeostasis.
2. Discuss the process of urine formation.
3. Relate knowledge of renal function from other courses, such as BIOL 205 and CLLS 224, to renal function tests performed in clinical chemistry laboratories.
4. For the non-protein nitrogenous compounds urea, creatinine, uric acid, and ammonia:

    a. Describe their source, metabolism, and clinical significance
    b. State the reference ranges for each compound
    c. Discuss the principles and procedures of common analytical methods for each compound
    d. Relate the results of measuring these compounds to assessments of renal function and other diseases, as assigned.

5. Explain how the measurement of 24-hour urine creatinine can be used to assess the validity of a purported 24-hour urine submitted for other testing.
6. Explain the principle of clearance tests.
7. Given laboratory values for a patient, calculate the creatinine clearance.
8. As assigned, measure non-protein nitrogen compounds in the laboratory. For each analyte, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section VI: Proteins

Upon completion of this section, the student will be able to:

1. Define the following terms:

    a. Acute phase reactant
    b. Complement
    c. Globulin
    d. Immunoglobulin
    e. Paraprotein
    f. Protein

2. Relate the following terms to the study of proteins:

    a. Amphoteric compound
    b. Isoelectric point
    c. Peptide bond
    d. Zwitterion

3. Discuss protein structure, to include:

    a. Composition of amino acids
    b. Primary structure
    c. Quaternary structure
    d. Secondary structure
    e. Tertiary structure

Section VI: Proteins, continued:

4. Explain why methods used to measure protein in serum or plasma cannot be used for other body fluids, such as CSF and urine.
5. As assigned in the laboratory, measure total protein, albumin, and CSF proteins. For each analyte, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.
6. Define electrophoresis and state some applications of electrophoresis in the clinical laboratory.
7. Describe the roles of each of the following in electrophoresis:

   a. Buffer
   b. Densitometer
   c. Power supply
   d. Stain
   e. Support medium

8. Explain how proteins can be separated by electrophoresis, and why this is useful.
9. Given serum protein results and electrophoretic patterns, correlate findings with disease states.

Section VII: Enzymes

Upon completion of this section, the student will be able to:

1. Define enzyme, and list properties that enzymes share in common.
2. Define the following terms:

   a. Active site
   b. Activator
   c. Apoenzyme
   d. Cofactor
   e. Coenzyme
   f. First order kinetics
   g. Holoenzyme
   h. Inhibitor
   i. Prosthetic group
   j. Zero-order kinetics

3. Explain the mechanisms of enzyme function in cells.
4. Describe how the following factors influence enzyme reactions:

   a. Activators
   b. Cofactors
   c. Enzyme concentration
   d. Inhibitors
   e. pH
   f. Substrate concentration
   g. Temperature

5. Define an international unit of enzyme activity.
6. Describe how physiological factors influence blood enzyme levels.
7. Discuss why enzymes are measured kinetically, rather than quantitatively.
8. Discuss the role of NAD^+/NADH in enzyme reactions, and calculate enzyme activity based on the molar absorptivity of NADH.
9. Explain why enzymatic reactions are often coupled together in test systems.
10. Discuss the use of enzymes as analytic reagents.
11. Given a set of coupled reactions, list the materials necessary to measure the activity of an enzyme in the reactions, identifying substrate, product, and cofactors/coenzymes, as appropriate.
12. List the six classes of enzymes and types of reactions catalyzed.
13. For enzymes commonly measured in the clinical laboratory, use the standard abbreviations.

Section VII: Enzymes, continued:

14. For each of the following clinically significant enzymes, state the biologic function; list tissue sources, discuss the clinical significance of elevated results, and describe analytical procedures, as assigned:

    a. ACP
    b. ALP
    c. ALT
    d. AMS
    e. AST
    f. ChE
    g. CK
    h. GGT
    i. LD
    j. LPS

15. Discuss the use of enzymes as laboratory aids in disorders of the following organs, as assigned:

    a. Bone
    b. Heart
    c. Liver
    d. Muscle
    e. Pancreas
    f. Prostate

16. Define isoenzyme, and discuss the clinical significance of isoenzymes of LD, CK, and ALP, as assigned.
17. List the enzymes commonly used as cardiac markers and their order of appearance after a myocardial infarction.
18. List the enzymes synthesized in the liver, their functions, and clinical significance.
19. As assigned, measure enzyme activity in the laboratory. For each enzyme, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section VIII: Electrolytes

Upon completion of this section, the student will be able to:

1. Name the two major compartments of body fluids and their relative percentages.
2. List the four colligative properties of solutions.
3. Define osmolality, and describe the effect of osmotically active particles on body fluids.
4. Calculate the osmolal gap, and explain the clinical significance of an increased osmolal gap.
5. Define electrolyte, and list the major electrolytes of extracellular and intracellular fluids.
6. Explain the concept of electro neutrality.
7. For each of the following electrolytes, state its cellular location, reference range, major physiologic function, and regulatory mechanisms:

    a. Bicarbonate
    b. Calcium
    c. Chloride
    d. Magnesium
    e. Phosphate
    f. Potassium
    g. Sodium

8. Describe the functions of the renin-angiotensin system and the action of antidiuretic hormone in maintenance of normal water balance.
9. Explain the clinical significance of the sweat chloride test.
10. Define anion gap, and discuss conditions causing increased or decreased anion gap.
11. Given electrolyte results for a patient, calculate the anion gap, as assigned.

Section VIII, Electrolytes, continued:

12. Discuss causes and symptoms of the following electrolyte disorders, as assigned:

    a. Hypercalcemia
    b. Hyperchloremia
    c. Hyperkalemia
    d. Hypermagnesemia
    e. Hypernatremia
    f. Hyperphosphatemia
    g. Hypocalcemia
    h. Hypochloremia
    i. Hypokalemia
    j. Hypomagnesemia
    k. Hyponatremia
    l. Hypophosphatemia

13. For each of the following analytes, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error:

    a. Bicarbonate
    b. Calcium
    c. Chloride
    d. Magnesium
    e. Osmolality
    f. Phosphate
    g. Potassium
    h. Sodium

14. As assigned, perform laboratory tests to quantitate electrolytes and osmolality in the laboratory. For each analyte, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section IX: Acid base balance

Upon completion of this section, the student will be able to:

1. Define the following terms, relating them to acid-base balance:

    a. Acid
    b. Base
    c. Buffer
    d. Conjugate base
    e. pH
    f. strong base
    g. Weak acid

2. Discuss the exchange of gases in the lungs and tissues.
3. Describe the processes of ventilation and respiration as they relate to the exchange of gases in the body.
4. Discuss factors affecting oxygen transport, oxygen dissociation, and the oxygen dissociation curve.
5. Explain the mechanisms of the following buffer systems:

    a. Bicarbonate/carbonic acid
    b. Hemoglobin
    c. Phosphate
    d. Protein

6. Write the Henderson-Hasselbalch equation, define its terms, and relate its significance to interpretation of the effects of the bicarbonate/carbonic acid buffering system.
7. Define and describe the isohydric shift and the chloride shift.
8. Describe respiratory and renal regulation of acid/base balance.
9. Define and discuss causes of, laboratory parameters for, compensatory mechanisms of, and appropriate treatment for the following acid-base disorders:

    a. Metabolic acidosis
    b. Metabolic alkalosis
    c. Mixed acid-base disorders
    c. Respiratory acidosis
    d. Respiratory alkalosis

Section IX, Acid – base balance, continued:

10. Describe proper specimen collection and handling procedures for samples used to analyze acid-base parameters, including precautions to avoid erroneous results.
11. Describe the procedures, principles, and component parts of the following types of measurement:

    a. pCO_2 measurement by Severinghaus electrode
    b. pH measurement by potentiometry
    c. pO_2 measurement by amperometry

12. Explain applications of transcutaneous blood gas measurement.

Section X: Bilirubin metabolism and liver function testing

Upon completion of this section, the student will be able to:

1. Review the anatomic and microscopic characteristics of the liver.
2. Review the major functions of the liver.
3. Describe the laboratory procedures used in the evaluation of liver function. Correlate findings with disease processes.
4. Describe methods of laboratory procedures used to measure bilirubin in the laboratory.
5. Define and classify jaundice. Describe the pathophysiology involved in each type of jaundice.
6. Describe the clinical and laboratory findings of liver disorders and correlate those findings with the pathophysiology of liver disorders.
7. Describe the biosynthesis of bilirubin, including conjugation in the liver.
8. State the clinical utility of the analysis of conjugated and unconjugated bilirubin and urobilinogen.
9. As assigned, measure bilirubin in the laboratory. Discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section XI: Lipids and Lipoproteins

Upon completion of this section, the student will be able to:

1. Review and discuss the chemical properties of lipids.
2. Define the following terms:

    a. Apolipoprotein
    b. Atherosclerosis
    c. Cholesterol
    d. Cholesterol ester
    e. Chylomicron
    f. Fatty acid
    g. Glycerol
    h. Lipid
    i. Lipoprotein
    j. Prostaglandin
    k. Triglyceride

3. List the composition of the four basic lipoproteins, describing the metabolism and function of each.
4. Describe pathophysiology, methodology, and reference range for cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol.
5. Discuss classifications, clinical significance and laboratory assessment of hyperlipoproteinemias.
6. As assigned, measure lipids in the laboratory. For each analyte, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error for:

    a. HDL cholesterol
    b. LDL cholesterol
    c. Total cholesterol
    d. Triglycerides

Section XII: Thyroid and Other Hormones/ Endocrinology

Upon completion of this section, the student will be able to:

1. Define the following terms:

   a. Amino-acid derived hormone
   b. Endocrine gland
   c. Exocrine gland
   d. Hormone
   e. Hormone receptor
   f. Peptide hormone
   g. Pre prohormone
   h. Prohormone
   i. Second messenger
   j. Steroid hormone
   k. Target cell

2. Classify hormones as protein, steroid, or growth factor, and list characteristics of each, as assigned.
3. List the major endocrine glands and the hormones they secrete.
4. Discuss the significance of free and bound hormone.
5. Describe negative and positive feedback mechanisms of hormone regulation.
6. Differentiate between primary and secondary disorders of the endocrine system.
7. Locate the thyroid gland.
8. Describe the regulation of the production of thyroid hormones, their biosynthesis, and their mechanisms of action.
9. For the following thyroid function tests, describe the principle and any special precautions needed in specimen collection and handling:

   a. Free T_3
   b. Free T_3 index
   c. Free T_4
   d. Free T_4 index
   e. RT_3
   f. Thyroid antibodies
   g. Total T_3
   h. Total T_4
   i. TSH

10. Given laboratory data, calculate FT_4I and FT_3I, as assigned.
11. List and define symptoms of hyperthyroidism and hypothyroidism.
12. Discuss the causes of, pathophysiology or, and laboratory findings in hyperthyroidism and hypothyroidism.
13. Describe the autoimmune nature of thyroid disorders.
14. Discuss and classify the inflammatory diseases of the thyroid and thyroid neoplasms.
15. As assigned, measure hormones in the laboratory. For each hormone measured, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

Section XIII: Therapeutic Drug Monitoring and Toxicology

Upon completion of this section, the student will be able to:

1. Define therapeutic drug monitoring and state conditions when its use is indicated.
2. State reasons why particular drugs must be monitored.
3. Define the following terms in relationship to therapeutic drug monitoring:

   a. Bioavailability
   b. Dose response
   c. Half-life
   d. Mechanism of action
   e. Minimum effective concentration
   f. Minimum toxic concentration
   g. Peak
   h. Steady state
   i. Therapeutic index
   j. Trough
   k. Volume of distribution

Section XIII: Therapeutic Drug Monitoring and Toxicology, continued:

4. List and describe four steps of drug disposition, including factors that influence each of these processes.
5. State the rationale for monitoring therapeutic drug concentrations.
6. List methods of analysis used for monitoring therapeutic drugs.
7. Describe proper sample collection procedures.
8. List specific classifications of drugs monitored and examples of each, to include, as assigned:

    a. Anticonvulsant/ anti-epileptic drugs
    b. Antimicrobial agents
    c. Anti-neoplastic drugs
    d. Anti-psychotic drugs
    e. Bronchodilators
    f. Cardiac drugs
    g. Psychotropic drugs

9. Define toxicology and the role of the clinical laboratory in providing toxicology testing services.
10. Describe the mechanism and symptoms of toxicity and its detection and treatment for the following classes of toxic substances, giving examples from each class, as assigned:

    a. Acetaminophen
    b. Amphetamines
    c. Barbiturates
    d. Benzodiazepines
    e. Cannabinoids
    f. Cocaine
    g. Gases
    h. Heavy metals
    i. Nonvolatile organic substances
    j. Opiates
    k. Propoxyphene
    l. Salicylates
    m. Tricyclic antidepressants
    n. Volatiles

11. Differentiate between quantitative and qualitative analytical procedures and screening methods and confirmatory methods.
12. Discuss the use of chromatography and immunoassays as screening tests.
13. As assigned, perform therapeutic drug monitoring in the laboratory. For each drug tested, discuss analytical procedures, including principles, specimen collection, reference ranges, and sources of error.

CLLS 224 **Hemostasis and Body Fluid Analysis**
Summer 2005

Description: The CLS student will learn the principles, techniques and clinical correlation with pathology for urinalysis, body fluid analysis and the hemostatic system.

CREDITS: 3

Lecture: Tuesday & Thursday; 10:00 – 11:35
Lab:
Section 211: Monday 9:00 – 11:05; Wednesday, Friday 10:00 – 12:05
Section 212: Monday 2:00 – 4:05; Tuesday, Thursday 4:00 – 6:05

Instructor: Dan de Regnier, M.S., MT(ASCP) & Sandy Cook, M.S., MT(ASCP)

Office: Lab Phone: 591-2268
Dan's Phone: 591-2327 Sandy's Phone: 591-2314

E-Mail: deregnid@ferris.edu and cooks@ferris.edu

Required Textbooks:

McKenzie: *Clinical Laboratory Hematology*, Prentice Hall, 2003
AND
Strasinger: *Urinalysis and Body Fluids*, F.A. Davis, 2002, 4th Edition.

Evaluation:

	Approximate % of Total
quizzes (6 x 20 pts each)	23%
lecture exams (2 x 100 points)	38%
lab exams (2 x 50 points)	19%
lab exercises (20 x 5 points)	19%
Total Points: 520	

Grading Scale:

A = 93-100 %	B- = 80-82.9 %	D+ = 67-69.9%
A- = 90-92.9 %	C+ = 77-79.9 %	D = 63-66.9%
B+ = 87-89.9 %	C = 73-76.9 %	D- = 60-62.9%
B = 83-86.9 %	C- = 70-72.9 %	F = < 60%

Class Attendance Policy:

Attendance is mandatory for both lecture and lab. This is a double-paced course and course material will be covered quickly. Make up of lab sessions is possible only in the case of extenuating circumstances.

If you are going to be absent from class or lab: **Leave a message at 591-2268 or **e-mail the instructor prior to the beginning of class.**

If you have a legitimate excuse (i.e. illness, statement from a funeral home, auto accident) you may receive credit once you make up a missed lab session. No credit may be earned without a legitimate excuse for the absence. Labs can NOT be made up on demand due to the need to prepare specimens and reagents. Please arrange any make up labs prior to the time that you will be available to make them up.

You may make up a quiz or exam without penalty, only if you notify the instructor as above and have a legitimate excuse. You will be penalized 20% on quizzes or exams taken late, if the instructor is not notified **AND** you do not have a legitimate excuse.

WEB-CT Use:

This course will also make use of Web-CT. There will be lecture notes available to you via this program, in addition to your current score in the course. Discussions about topics relevant to the course will also be ongoing both on Web-CT and via email.

Cell Phone Policy:

Please turn your phones off before entering the classroom or lab. If you need to use your phone, you may do so outside the classroom/lab during any breaks that we have, however, please be courteous about your phone use -- remember that there are other people in the building that you may disturb if you are shouting on your phone.

Lab Policies:

You are expected to follow safety precautions in the laboratory. This includes the appropriate use of personal protective equipment, following safety rules, and exercising good judgment. You may NOT wear shorts in the lab, nor open toed shoes/sandals, and to keep Dan happy – NO HATS! Keeping a pair of lab appropriate shoes & socks in your locker, in addition to a pair of long pants/scrubs is recommended.

Tentative Lecture & Lab Schedule
Reading assignments listed in italics.

Date	Lab Topic		Date	Lecture Topic
6/14 6/15	No lab		6/16	Intro/Kidney Review/Renal Function Tests *Strasinger, Chapter 2, pp. 9-20, Chapter 3, pp. 23-31, Chapter 4, pp. 33-41.*
6/16 6/17	Physical Exam, Specific Gravity (refractometer plus urinometer demo)			**Quiz**
6/20	Intro to Urine Strips; Clinitest, SSA		6/21	Chemical Testing *Strasinger, Chapter 5, pp.43-63.*
6/21 6/22	Urine Strips & Strip Readers; Ictotest		6/23	Intro to Microscopics *Strasinger, Chapter 6, pp. 67-103.*
6/23 6/24	Complete UA			**Quiz**
6/27	Complete UA		6/28	Renal Disease *Strasinger, Chapter 8, pp. 123-131.*
6/28 6/29	Complete UA		6/30	Non-Renal Disease (metabolic) *Strasinger, Chapter 9, pp. 135-145.*
6/30 7/1	Complete UA/Intro to Hemacytometer			**Quiz**
7/4	Independence Day – No Classes!		7/5	BF Analysis (csf, serous fluids, synovial) *Strasinger, Chapter 10, pp. 149-165; Chapter 13, pp. 189-198; Chapter 12, pp. 179-186.*
7/5 7/6	Hemacytometer & CSF Counts		7/7	BF Analysis (stool, semen, miscellaneous) *Strasinger, Chapter 15, pp. 209-215; Chapter 11, pp. 169-176, Chapter 14, pp. 201-206*
7/7 7/8	**UA Lab Practical**			
7/11	**UA Lecture Exam**		7/12	Intro to Coagulation; Platelets *McKenzie, Chapter 34, pp. 653-672*
7/12 7/13	Manual Platelet Count; Bleeding time demo		7/14	Coag Factors I *McKenzie, Chapter 35, pp. 675-689.*
7/14 7/15	Intro to fibrometer; PT			**Quiz**
7/18	Fibrometer (PT/APTT)		7/19	Coag Factors II *McKenzie, Chapter 35, pp. 675-689.*
7/19 7/20	Fibrometer (PT/APTT); FDP		7/21	Fibrinolysis *McKenzie, Chapter 35, pp. 689-693.*
7/21 7/22	Manual Fibrinogens & cal curve			**Quiz**
7/25	Factor Substitutions		7/26	Coag Inhibitors *McKenzie, Chapter 35, pp. 693-698.*
7/26 7/27	Instrumentation		7/28	Hemostatic Disorders *McKenzie, Chapter 36, pp. 703-725; Chapter 37,*

				pp. 729-756, Chapter 38, pp. 760-776.
7/28 7/29	Instrumentation			**Quiz**
8/1	Instrumentation		8/2	Monitoring Anticoagulant Therapy *McKenzie, Chapter 38, pp. 776-778.*
8/2 8/3	Instrumentation		8/4	Special Coag Testing *McKenzie, Chapter 39, pp. 784-801.*
8/4 8/5	Instrumentation			
8/8	Instrumentation		8/9	**Coagulation Lecture Final**
8/9 8/10	**Coagulation Lab Practical**			

Urine and Body Fluid Analysis
Objectives

Upon completion of CLLS 224 you will be able to complete the following objectives:

A. Introduction to Urinalysis

1. List two reasons for performing a urinalysis.
2. List the major chemical constituents of urine.
3. Describe a method for determining if a questionable fluid is urine.
4. Define anuria, oliguria, polyuria, and nocturia.
5. List the three basic rules for specimen handling and explain their importance.
6. Briefly discuss methods for preserving urine specimens, including their advantages and disadvantages.
7. List the changes that may take place in a urine specimen that remains at room temperature for more than 2 hours.
8. Instruct a patient in the correct procedure for collecting a timed urine specimen.
9. Describe the type of specimen needed to obtain optimal results when a specific urinalysis procedure is requested.
10. Define the common terms and abbreviations encountered in urinalysis and use them in proper context.

B. Renal Function

1. List and/or label the major parts of the urinary system.
2. List and/or label the parts of a nephron.
3. Describe the functions of the kidneys.
4. List and/or label the parts and describe the function of each part of the nephron to include:
    a. glomerulus
    b. proximal convoluted tubule
    c. Loop of Henle
    d. distal convoluted tubule
    e. collecting duct
    f. blood supply
5. List the major differences in the fluid that enters the glomerulus from that which leaves the collection duct.
6. Discuss the physiologic mechanisms of glomerular filtration, tubular reabsorption, tubular secretion and renal blood flow.
7. Discuss testing methods, in addition to routine urinalysis, that may be used to evaluate a patient's renal function.

C. Physical Findings in Urine.

1. List the normal range of urine colors and substances responsible for these colors.
2. List abnormal urine colors and the reason each color may occur.
3. Discuss when the presence of bilirubin in a specimen may be suspected.
4. Discuss the significance of cloudy red urine and clear red urine.
5. Define the appearance of a urine specimen and list the common terminology used to report the appearance.
6. Discuss the significance of amorphous phosphates and amorphous urates in freshly voided urine and describe how they affect a specimen's appearance.
7. List pathologic and nonpathologic causes of a cloudy urine.
8. Identify the color and appearance of each specimen tested in the student laboratory.
9. Define specific gravity and discuss why it is valuable in the routine urinalysis.
10. Discuss the principles for measuring specific gravity.
11. Outline the procedure for doing specific gravity using a urinometer.
12. Outline the procedure for doing specific gravity using a refractometer.
13. Perform specific gravity on urine using a refractometer. Student values must agree within 1.002 of the instructor's values.
14. Given the necessary information, correct the specific gravity when the temperature, glucose or protein concentrations are abnormal.
15. Calibrate a refractometer with distilled water.
16. List the normal ranges for urinary specific gravity.
17. List the causes of specific gravities above 1.035.
18. Prepare dilutions for urine specimens with specific gravity above 1.035, and discuss how to calculate the specific gravity using the dilution factor.

D. Chemical Examination of the Urine

1. Perform chemical tests on urines using manufacturer's reagent strips, including: glucose, bilirubin, blood, leukocyte esterase, urobilinogen, specific gravity, protein, ketones, nitrites, and pH.
2. Perform procedures to detect reducing substances using Clinitest tablets. Results must be within values established by the instructor.
3. Determine when to use Clinitest tablets and when to use reagent strips.
4. Discuss the principle of using the sulfosalicylic acid method for urine protein.
5. Perform the sulfosalicylic acid procedure for urinary protein and explain when it is appropriate to use this method.
6. Correlate the protein, occult blood, and microscopic findings in a given urine specimen.
7. Perform urinary bilirubin determinations on urine within values established by the instructor using Ictotest tablets
8. Evaluate urobilinogen and bilirubin results as aids in the differential diagnosis of jaundice.
9. OBJECTIVES 1-31 in Chapter 5, *Urinalysis and Body Fluids*, Strasinger

E. Microscopic Examination of Urine

1. List the importance of each of the following in preparing urine sediments.
    a. fresh specimen
    b. well mixed specimen
    c. volume of urine
    d. time of centrifugation
    e. speed of centrifugation
    f. aspiration of supernatant urine
    g. mixing sediment
    h. placing on slide
    i. coverslipping
2. Identify and/or quantitate according to values established by the instructor using a light or phase microscope or polarizing light as indicated.
    a. Red blood cells
    b. White blood cells including "Glitter" cells
    c. casts
    d. crystals
    e. microorganisms and ova
    f. epithelium
    g. mucous
    h. miscellaneous: sperm, oval fat bodies, mucus
    i. artifacts
3. Correlate the microscopic findings with the chemical tests performed as part of the routine urinalysis.
4. OBJECTIVES 1-18 in Chapter 6, *Urinalysis and Body Fluids*, Strasinger

F. Renal Disease

1. Discuss the causes, renal functions affected and the typical urinalysis findings in the following:
    a. acute glomerulonephritis
    b. chronic glomerulonephritis
    c. nephrotic syndrome
    d. pyelonephritis
    e. renal failure
    f. renal tubular acidosis
2. OBJECTIVES 1-16 in Chapter 8, *Urinalysis and Body Fluids*, Strasinger

G. Metabolic Disorders

1. OBJECTIVES 1-20 in Chapter 9, *Urinalysis and Body Fluids,* Strasinger
2. Describe the physiologic mechanisms, clinical features, and urinalysis findings in the following carbohydrate disorders: glucosuria, diabetes mellitus, galactosuria

H. Cerebrospinal Fluid

1. Perform CSF cell counts using a hemocytometer and proper dilutions based on appearance and number of cells within the established criteria stated by the instructor.
2. Identify with 70% accuracy normal and abnormal cells found in CSF
3. Describe the procedure for lumbar puncture and the proper collection & handling of CSF.
4.OBJECTIVES 1-12, 15-17, 22, 24 in Chapter 10, *Urinalysis and Body Fluids*, Strasinger

I. Miscellaneous Body Fluids

a. Semen Analysis

1. OBJECTIVES 1-15 in Chapter 11, *Urinalysis and Body Fluids*, Strasinger

b. Synovial Fluid

1. OBJECTIVES 1-7 in Chapter 12, *Urinalysis and Body Fluids*, Strasinger
2. Describe the chemical composition of synovial fluid in normal and disease states.

c. Serous Fluids

1. OBJECTIVES 1-9, 13-14 in Chapter 13, *Urinalysis and Body Fluids*, Strasinger
2. Describe the appearance of cellular components that may appear in a serous fluid.

d. Amniotic Fluid

1. OBJECTIVES 1-4, 6-8 in Chapter 14, *Urinalysis and BodyFluids,* Strasinger
2. List the indications and appropriate stages in pregnancy for performing an amniocentesis.
3. Describe how amniotic fluid is differentiated from urine.

e. Stool Analysis

1. OBJECTIVES 1-7, 10-11 in Chapter 15, *Urinalysis and Body Fluids,* Strasinger
2. Discuss the physical conditions that result in steatorrhea.
3. Discuss the different methodologies for determining if steatorrhea is present.

f. Vaginal Secretions

1. Discuss the proper handling and collection of vaginal secretion specimens.
2. Describe the following tests:
   wet mount, amine test, KOH prep
3. Describe laboratory results for the following conditions:
   bacterial vaginosis, candidiasis, trichomoniasis

HEMOSTASIS OBJECTIVES

Upon completion of the following units, the student will be able to complete the following objectives:

Section I -Introduction to Hemostasis:

A. Vascular Phase
   1. Define the following terms with respect to the vasculature:
      a. Endothelial cells
      b. Basement membrane
      c. Collagen
      d. Vasoconstriction
      e. Serotonin
      f. Prostacyclin (PGI_2)
   2. Discuss the structure and function of vessels as they relate to the vascular phase of hemostasis.
   3. Discuss how the endothelium is capable of keeping the blood in a liquid state
   4. Discuss which tests are used to evaluate vascular function

B. Platelets
   1. Describe platelet ultrastructure with respect to:
      a. Alpha granules
      b. Dense bodies
      c. Contractile proteins
      d. Microtubules
      e. Cytoplasmic membrane and glycoproteins

   2. List and describe the three functions of platelets in hemostasis.
   3. Describe the physical and biochemical mechanisms for the following:
      a. Adhesion
      b. Aggregation
      c. Release and feedback reactions
      d. Formation of first hemostatic plug
      e. Clot retraction
      f. Procoagulant activity

   4. Discuss vessel size as it relates to the platelet phase of hemostasis.
   5. Describe platelet biochemistry as it relates to hemostasis including:
      a. Thromboxane production
      b. Binding proteins (adhesion and aggregation)
      c. Glycoproteins
      d. Biomolecules that activate platelets
   6. Discuss platelet production: origin of platelets, endomitosis, and age vs. size
   7. Explain how aspirin acts to inhibit platelet function.

C. Coagulation

1. Define the following terms in relation to the coagulation phase of hemostasis:

a. Zymogen
b. Activated complex
c. Coenzyme (Cofactor)
d. Proteolytic enzyme
e. Substrate
f. Activated enzyme
g. Binder
h. Phospholipid (PF3)
i. surface (serine proteases)

2. Briefly discuss each of the clotting factors with respect to:
   a. Names (Roman numerals and synonyms)
   b. Biochemical structure
   c. Stability *in vitro*
   d. Site of production
   e. Vitamin K requirements
3. Discuss contact activation of the intrinsic coagulation system.
4. Describe the biochemical reactions for:
   a. Activation of Factor IX and X
   b. Prothrombin to thrombin conversion
   c. Fibrinogen to fibrin conversion
   d. Fibrin to stabilized fibrin conversion
5. Diagram the intrinsic and extrinsic sequences of coagulation
6. Discuss the *in vivo* and *in vitro* activation of the intrinsic and extrinsic clotting mechanisms.
7. Describe how clot formation is limited *in vivo*.

D. Fibrinolysis:

1. Define the following terms with respect to fibrinolysis:
   a. Fibrinolysis
   b. Fibrinogenolysis
   c. Fibrin(ogen) degradation (split) products (FDP or FSP)
   d. Plasminogen
   e. Plasmin
   f. Primary fibrinolysis
   g. Secondary fibrinolysis
   h. Anti-Plasmin
2. List the activators and inhibitors of the fibrinolytic system.
3. Describe the reactions that occur when plasmin acts on fibrin or fibrinogen.
4. Diagram the sequence of reactions of the components of the fibrinolytic system.

E. Interrelationships

1. Diagram the sequence of events following vascular injury.
2. Discuss the relationships of the four phases of hemostasis.

Section II: Survey of Disorders of Hemostasis:

A. Vascular disorders
1. Define these terms with respect to vascular disorders and hemostasis:
a. Purpura
b. Petechiae
c. Ecchymoses
d. Thrombosis
e. Thromboembolus
f. Infarction
g. Acquired defect
h. Congenital (hereditary) defect
2. List the common acquired vascular defects and the causes of each.

B. Platelet Disorders
1. Define these terms with respect to hemostasis:
a. Thrombocytopenia
b. Thrombocytosis
c. Thrombocythemia
d. Thrombocytopathy
e. Idiopathic
2. List the major causes and disease names for each of the following:
a. Acquired thrombocytopenia
b. Hereditary thrombocytopenia (vWD)
c. Acquired thrombocytosis
d. Acquired thrombocytopathy
e. Hereditary thrombocytopathy
3. Discuss the expected results of the function & screening tests for platelet counts in the above.

C. Coagulation Disorders
1. List and describe the four most common hereditary coagulation disorders as to:
a. Factor affected
b. Means of inheritance
c. Characteristic response to therapy
2. List and describe the most common acquired coagulation disorders as to:
a. Cause
b. Factors affected
c. Therapy
d. Disorders of Fibrinolysis
3. In cases of DIC plus secondary fibrinolysis, list and describe:
a. Disorders associated with this syndrome
b. Physiological effect of the disorders
c. Effect on clotting factors and platelets
4. In cases of primary fibrinolysis, list and describe:
a. Disorders associated with this syndrome
b. Physiological effect of the disorders
c. Effect on clotting factors and platelets

Section III: Laboratory Approach to Investigation of Disorders of Hemostasis

A. Screening Tests
1. List the tests more frequently used to screen for disorders of hemostasis.

2. State the principle of the following screening tests to include procedure, reagents, factors tested (including platelets), sensitivity, false results and normal values:

a. Bleeding Time
b. Platelet count
c. Prothrombin Time (PT) including INR reporting
d. Activated partial thromboplastin time (APTT)
e. Fibrinogen assay
f. Thrombin time
g. FDP Assay
h. D Dimer Assay

3. Discuss the principle of each of the following methods of clot detection:

a. Manual methods - tilt tube
b. Semiautomated / automated methods
    1) Electro-Mechanical
    2) Optical

4. Perform or observe a prothrombin time assay by a tilt tube method.

5. Given a picture of the Fibrometer or the actual instrument, identify and explain the function of these parts:

a. On-off switch
b. Digital readout
c. Indicator light
d. Reset button
e. Warming wells
f. Reaction well
g. Probe arm
h. Stationary electrode
i. Moving electrode
j. Timing bar
k. Power connection

6. Explain the purpose of each of the components listed above.

7. Explain the principle of operation of the fibrometer.

8. Perform routine maintenance procedures according to the guidelines given in the unit.

9. Demonstrate the proper procedure for using the fibrometer by accurately performing the prothrombin time and the APTT according to the task detailing so:

a. The samples are done in duplicate and agree + or - 10%
b. The controls are within the acceptable range.

10. Demonstrate that the instrument is not performing correctly by taking appropriate corrective action as specified.

11. Perform each of the following tests according to the criteria in the procedure:

a. Platelet Count
b. Prothrombin Time
c. APTT
d. Fibrinogen Assay
e. FDP Assay or D-Dimer

12. Discuss the principle of the following screening tests:

a. Tourniquet test
b. Activated whole blood clotting time
c. Clot retraction

B. Special Tests:

1. Correctly list the method of preparation, components, and uses of adsorbed plasma and aged serum in the differential PT and APTT.
2. Discuss the principle of the following special tests to include principle, factor(s) tested, and normal values:
    a. Platelet aggregation
    b. Substitution (Differential) PT and APTT
    c. Factor Assays (VIII, IX, XIII)
    d. Fibrin monomer assays
    e. Plasmin Assays
    f. Tests for Anti-Phospholipid Antibodies
    g. Factor V Leiden
    h. AT III, Protein C and Protein S, Prothrombin 20602 assays

C. Quality Control:

1. Define the following terms in respect to hemostasis:
    a. Standard
    b. Control
2. State the necessity for consistent quality control methods in the coagulation laboratory.
3. Discuss proper treatment of specimens for coagulation testing with respect to:
    a. Venipuncture techniques
    b. Time delay before testing
    c. Storage techniques
    d. Thawing frozen samples
4. Discuss anticoagulation of blood samples for coagulation testing with respect to:
    a. Types of anticoagulant used (name two examples)
    b. Mode of action of anticoagulant
    c. Ration of anticoagulant to blood
    d. Effects of too little or too much anticoagulant
5. Indicate how each of the following contributes to maintaining quality control:
    a. Frequent temperature checks (refrigerator, heat blocks, water baths)
    b. Utilizing properly cleaned glassware
    c. Performing tests in duplicate
    d. Recording all results
    e. Running normal and abnormal controls
    f. Maintaining reagent logs
    g. Utilizing consistent techniques
6. Define and utilize effective methods of quality control for each of the following tests:
    a. Platelet count
    b. Bleeding time
    c. Prothrombin time

d. APTT
e. Fibrinogen assay
f. Thrombin time

D. Anticoagulant Therapy

1. Compare and contrast heparin and coumarin anticoagulation with respect to:

a. Mode of administration
b. Mode of action
c. Speed of action
d. Duration of action
e. Means of monitoring
f. Therapeutic range and INR
g. Pharmacologic antidote
h. Disease states when administered

E. Introduction to Correlation:

1. Determine whether credible hemostasis test results should be:
   a. Reported out
   b. Referred to appropriate personnel

2. Identify the probable hemostatic defect(s), given the results of the hemostatic screening tests (Bleeding time, PT, APTT, Fibrinogen, FDP or D-Dimer and Platelet count).

3. Predict the expected results on the screening tests (as in #2 above) for the following disorders:

a. Aspirin ingestion
b. Thrombocytopenia
c. Thrombocytopathy
d. Coumarin therapy
e. Heparin therapy
f. Hemophilia A
g. Hemophilia B
h. von Willebrand's
i. Hypofibrinogenemia
j. DIC plus fibrinolysis
k. Primary fibrinolysis
l. Any other single or multiple factor deficiency.
m. Anti-Phospholipid Ab
n. Inhibitor deficiencies (ATIII, Protein C, Factor V Leiden)

4. Indicate the special tests of hemostasis that should be performed to confirm the diagnosis of the disorders listed in #3.

CLLS 228: Immunohematology
Fall, 2004

I. General Course Information

A. Meeting times:

1. Class: 0800 – 0850, WF, VFS 423
2. Lab 211: 0900-1050 W, VFS 104; 0800 – 1050 F, VFS 421

A. Credit Hours: 3
B. Course Configuration: 2+4
C. Course Description: An introduction to theory and practice of contemporary blood banking, including collection, storage and processing of blood components, role of RBC antigens and antibodies in compatibility testing and transfusion practice, application of knowledge and test results in conditions such as hemolytic disease of the newborn and transfusions reactions, and beginning problem solving.
D. Prerequisites: BIOL 205 or equivalent.

II. Instructor: Barbara Ross MS, MT(ASCP)

A. Office: VFS 303
B. Office phone: 231.591.2317
C. E-mail: ROSSB@FERRIS.EDU
D. Office Hours: 0900 – 1050 TR and by appointment. You're probably in class during these hours. When you need to see me, we'll work something out. We'll see each other every day.

III. Required books: two, a text and a lab manual. Buy them both! Keep them both! You may have another blood bank course in your future, and you certainly have internship.

A. Harmening, Denise M. *Modern Blood Banking and Transfusion Practices*, Fourth Edition. FA Davis, 1999. **Reading assignments are found on the class schedule.**

B. Ross, Barbara. *CLLS 228 Laboratory Manual.* Available at Lundberg Bookstore, Rankin Center.

C. Why these books?

1. **Harmening** is a well-organized author, who has gathered a number of experts to put this book together. It is current, well written, and may even interest you.

2. **Ross** contains all the lab procedures you'll need in this course. Bring the lab manual to every lab session. Save it! Some of the lab procedures will be needed in later courses.

IV. Course Goals and Objectives:

A. The objectives are at the end of this syllabus.

B. Course Goals: In keeping with the CLS program goals, found in the CLS Student Handbook, goals for this course are to provide you with opportunities to:

1. Practice safe laboratory procedures, applying knowledge of blood borne pathogens and chemical hygiene.

Course goals, continued:

2. Develop technical competence, including the ability to integrate theory and practice.
3. Test reagents for expected reactivity, and to maintain instruments in common use in the transfusion service laboratory.
4. Evaluate the suitability of samples submitted for testing.
5. Perform blood bank tests, interpret and evaluate the validity of results, recognize unusual results and perform or recommend follow-up testing when indicated.
6. Practice procedures used daily in transfusion service laboratories, including communication of test results to physicians and others, as needed.
7. Be aware of external regulatory requirements for quality laboratory operations, and apply them as assigned.
8. Correlate results from other laboratory sections with transfusion service results, and relate all to the clinical condition of the patient.
9. Practice professional behaviors, including maintaining confidentiality of patient data, neatness in work habits, performing to the best of your abilities, following established program policies, and assuming responsibility for your own learning in this course.

V. **Instructional Methods:** lecture, discussion, critical thinking assignments, laboratory exercises, and competency demonstrations.

VI. **Course Requirements**

A. **Critical Thinking Assignments (27 at five points each).** At the beginning of each class, we will spend about five minutes discussing the Critical Thinking assignment that was given to you at the previous class session. You will get two copies of this assignment. ONE COPY is due BEFORE class begins, and you must turn it in YOURSELF to get full credit. Keep the other copy to take notes during the discussion.

5 points	CT assignment turned in on time BY YOU, with all questions answered correctly.
4 points	CT assignment turned in on time BY YOU, with most questions answered correctly.
3 points	CT assignment turned in on time BY YOU, with some questions answered correctly.
2 points	CT assignment turned in BY YOU after the discussion, so you could record the correct answers.
1 point	CT assignment turned in BY YOU after the discussion, still without the correct answers.
0 points	CT assignment not turned in, or turned in by someone other than you.

B. **Class time:** Interactive lecture/Q+A about topics listed on the schedule. Please complete the reading assignments ahead of time. They'll help you answer the CT questions.

C. **Lab:** Most labs will require you to turn in documentation of the work you did and the results you got for your tests, including your interpretations. I am very picky about documentation, because clerical errors are the cause of most fatalities related to blood bank practices. You must record results IN INK, and you must come to conclusions. Remember to record date, time, and your initials. For most labs, you will have your own workstation and you are expected to do your own work. I'm also picky about being on time: lab starts at 0900, and I expect you to be in your seat, with lab coat buttoned, ready to go then.

Course requirements, continued:

D. **Competency assessments:** Four times during the term, you will be asked to demonstrate that you can complete a common laboratory task correctly, including explaining what you are doing and why. Competencies to be assessed are listed on the lab schedule. The final assessment will be a laboratory quiz. For any competency assessment, you may use your lab manual or any source other than the instructor or another student.

E. **Exams:** Exams will be given in lab, so that you won't have to hurry. Most exams will be about 80% multiple choice, 20% short answer. Most of the short answer questions will ask you to interpret patient results, or explain what you would do next. About a week before each exam, I will let you know exactly which objectives will be covered on that exam.

F. Most exams are cumulative. They have to be. We begin with ABO typing, and it will still be important at the end of the term. Course material builds on other material.

G. **Venipuncture:** You will have five specific venipuncture assignments, with due dates.

VII. Resources, References and Supplies

A. Web Resources:

http://rex.nci.nih.gov/behindthenews

A terrific site with an easy tutorial about immunology. If you need a review with great illustrations, this is the site for you. Also available en Español.

http://www.biology.arizona.edu/human_bio/problem_sets/blood_types/Intro.html

A wonderful tutorial about ABO types and how they are inherited. Also new tutorials about the Rh system, including how to figure out genotypes after you've typed somebody. It will help with lab! En Español, if you want it that way. There's also a tutorial about ELISA testing, if you need to review that.

http://www.aabb.org

The official site of the American Association of Blood Banks. It includes sections about donating and receiving blood, written for patients: All About Blood and Donate and Receive Blood. There are also links to other professional societies, and government agencies such as the FDA and CDC,

http://www.Pall.com

The site of a corporation that makes all kinds of filters, including leukocyte reduction filters for blood components. They have an online newsletter, as well as information about the ongoing discussion about whether all transfusions should have leukocytes removed (but remember, they're selling the filters, so they have a strong opinion about this). Look under MEDICAL.

http://www.miblood.org

The Michigan Community Blood Centers. Includes information about their stem cell collection and transplant program. Look under ABOUT BLOOD

Web resources, continued:

http://www.redcross.org/services/biomed

The blood donation activities of the American Red Cross

http://www.cc.nih.gov/dtm

The Blood Center of the National Institutes of Health, and all the testing and services that it provides.

http://www.bloodctrwise.org

The Blood Center of SE Wisconsin, with lots of links to lab tests and such.

http://www.vh.org

The Virtual Hospital site at the University of Iowa. Search on blood bank and see what you can find.

Let me know if you find other useful sites!

B. Supplies that you need for this course:

Wear your lab coat to each lab, unless instructed otherwise. Wear your nametag. Bring a BLACK indelible marker, to write on test tubes (Sharpie is a good brand). Bring your timer.

VIII. Grading and Evaluation

A. What work will be graded?

Exams	4@ 100 each	400	40%
Final	COMPREHENSIVE!	100	10%
Critical Thinking	26 @ 5 EACH	130	13%
Lab Exercises	17 @ 10 each	170	17%
Competency Assessments	4@ 25 each	100	10%
Venipuncture	4@ 25	100	10%
Total	Points	1000	100%

The standard grading scale of the CLS programs will be used. Refer to the CLS Student Handbook.

B. Level of comprehension expected: There are some things to memorize. However, I'm less interested in your ability to memorize than I am in your ability to APPLY what you have learned, in this class, in your next blood bank course, on your clinical experience, and on the job. Nobody is ever going to come to the lab while you're working and demand that you list the eight common combinations of Rh factors from memory. They WILL call you and ask if an rr donor can be safely transfused to an R_1r patient. You'll need to be able to answer.

C. Labs: The early labs will be exercises where you learn to perform common techniques. The rest of the course will be situations where you will apply both your knowledge and skills. Which tests should be done in this situation, and what do these results mean, and where do we go from here? In other words, problem solving. I'm picky about documenting what you have done. There's a correct way to do it, and I expect you to use it.

Grading and Evaluation, continued:

D. **Exams:** Exams involve application and problem solving, as well. I want you to gain knowledge so that you can USE IT. It's fun when you know what to do!

IX. Attendance requirements

A. **College Attendance Policy:** The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. **Mrs. Ross's Attendance Policy:**

1. **I will take attendance in this course.** You're learning techniques to use on the job in the contemporary transfusion service. When you leave Ferris for clinical experience, the instructors will expect that you have learned these procedures, and the theory behind them. Therefore, I expect you to attend every class. Think of this as your job. If you must be absent, as with a job, telephone IN ADVANCE (231-591-2317) and leave a message. If you don't, I will assume that you are absent due to lack of interest, and are also not interested in making up the quiz or lab. It is time to be serious about your work.

2. **Acceptable excuses include:** illness, weather emergency, death in the family, required court appearances, and trips made by you as a varsity athlete.

Mrs. Ross's Attendance Policy, continued:

3. **If you miss class with an excuse reported ahead of time:** See me. Turn in the Critical Thinking assignment that was due on the day you missed class, and I'll give you the next one. We'll figure out a way for you to learn the content that you missed. If you missed lab, we'll have to schedule a time for you to make it up.

4. **If you missed class without an excuse:** You're on your own for the content. I won't accept your Critical Thinking assignment that was due that day, and you won't have the one for the next day, either. If you missed a lab, a competency assessment, or an exam, you're out of luck. You also get a zero for the points assigned.

C. Mrs. Ross's Tardiness Policy:

Class begins at 0800, and labs begin at 0900. I expect to see you present, with materials available, and ready to go. If you're not, expect to lose points for any assignment that you began late.

XI. Guidelines for Student Conduct

A. Come on time and be ready to start.
B. Wear your lab coat, long pants, and shoes with closed toes and heels to lab.
C. Wear your nametag.
D. Bring the supplies you need: Sharpie, timer, and lab manual, something to write with.
E. Clean up after yourself.
F. Cooperate.
G. Have fun, and learn all you can.

XII. Other General Course Policies

A. ADA: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

B. Harassment: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

C. Religious Holidays: refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm for a copy of this policy.

D. Disruptive Student Policy: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

E. Academic Honesty: We expect you to do your own work, and take responsibility for results. Refer to: http://www.ferris.edu/htmls/academics/course.offerings/clinlabs/handbook/academichonest.html

XII. Additional Information

1. If you have a disability that would make it difficult to complete the objectives of this course, see Mrs. Ross STAT. We'll see what we can do to help.
2. If you can't find me when you have a question, or if you are a shy person, or whatever: you can send e-mail. My address is **ROSSB@FERRIS.EDU**. Don't be afraid to ask questions, or send comments, or whatever. I'll respond.

CLLS 228: IMMUNOHEMATOLOGY
TENTATIVE CLASS SCHEDULE
FALL, 2004

DATE	TOPIC	READING ASSIGNMENT (Harmening)
0901 W	Introduction Organization of the Transfusion Service Laboratory	SKIM chapter 13
0903 F	Factors Influencing Antigen-Antibody Reactions	pp. 57 – 63
0908 W	ABO System	Chapter 5: especially pp. 90 – 105
0910 F	ABO System	---
0915 W	ABO System; Rh System	Chapter 6: especially pp. 128 – 139
0917 F	Rh System	---
0922 W	Other Blood group Systems	SKIM chapters 7 – 9
0924 F	**NO CLASS**	---
0929 W	Antiglobulin Test	Chapter 4; Antibody Screen, pp. 255 – 259
1001 F	**Alumni Return Day**	**Attend Sessions**
1006 W	Antiglobulin Test	---
1008 F	Compatibility Test	Chapter 12; Special Considerations, pp. 351 – 355
1013 W	Compatibility Test	---
1015 F	Compatibility Test	---
1020 W	Transfusion Therapy	pp. 355 – 359
1022 F	Antibody Identification	Chapter 11: pp. 259 – 265
1027 W	Antibody Identification	---
1029 F	Transfusion Reactions	Chapters 18 and 19
1103 W	Transfusion Reactions	---
1105 F	Transfusion Reactions	---
1110 W	Hemolytic Disease of the Newborn	Chapter 20
1112 F	Hemolytic Disease of the Newborn	---
1117 W	Hemolytic Disease of the Newborn	---
1119 F	Hemolytic Disease of the Newborn	---
1124 W	Donors	Chapter 10: pp. 214 – 237
1126 F	**THANKSGIVING BREAK: NO CLASS**	**No class**
1201 W	Storage	---
1203 F	Components	Chapter 10: pp. 238 – 248; Chapter 16
1208 W	Components	---
1210 F	Components	---

CLLS 228 TENTATIVE LABORATORY SCHEDULE
Fall, 2004

Date	Tasks	Points
0901 W	Introduction Basic Techniques: Assessing samples, making cell suspensions, reading and grading reactions **Assignment:** If you want to type your blood, get it drawn by Tuesday 090704	10
0903 F	ABO, Rh typing	10
0908 W	Typing for K antigen Typing for MN, A_1, H antigens	10
0910 F	Basic Technique: Cell Washing Rh phenotype Typing for weak D	10
0915 W	Direct antiglobulin test Antibody screen	10
0917 F	Reagent Quality Control **Venipuncture #1 due TODAY**	lab: 10 VP: 25
0922 W	**Competency Assessment: Making a Cell Suspension** **Review for exam: BRING QUESTIONS!**	20
0924 F	**EXAM 1**	100
0929 W	Discuss exam Centrifuge calibration	10
1001 F	**ALUMNI RETURN DAY**	---
1006 W	Type and screen	10
1008 F	**VP #2 DUE**	25
1013 W	**Competency Assessment: Washing Cells** **Review for exam: BRING QUESTIONS!**	20
1015 F	**EXAM 2**	100
1020 W	Discuss exam Compatibility test: one patient, two units	10
1022 F	Incompatible crossmatches	10
1027 W	Compatibility testing: patient with history	10
1029 F	Antibody Identification	10
1103 W	Compatibility test: patient with antibody	---
1105 F	Finish patient with antibody **VP #3 DUE**	Lab: 10 VP: 25
1110 W	**Competency Assessment: Reading and Grading Reactions** **Review for exam: BRING QUESTIONS!**	20
11112 F	**Exam #3**	100
1117 W	Discuss exam Prenatal testing	10
1119 F	Cord blood testing	10
1124 W	RhIG screening Fetal bleed screening	10
1126 F	**Thanksgiving break: count your blessings!**	---
1201 W	Donor testing problem	10
1203 F	**VP #4 due**	25
1208 W	**Competency assessment: Assessing Samples** **Review for exam: BRING QUESTIONS!**	20
1210 F	**Exam 4**	---

CLLS 228: Immunohematology
Course Objectives

Section I: Laboratory Safety

Upon completion of this section, the student will be able to:

1. Apply knowledge of safe laboratory practice to all laboratory assignments.
2. Document review of chemical hygiene and blood borne pathogens safety training for the current academic year.
3. Correctly use equipment and procedures to assure safety, including:

    a. Disposable gloves
    b. Disinfectant cleaner
    c. hand washing
    d. laboratory coats

4. Leave centrifuges closed while running.
5. Dispose of glassware, contaminated samples, contaminated supplies, and other items correctly, as instructed.
6. Demonstrate or describe proper use of the following safety equipment, as assigned:

    a. Eye wash station
    b. Fire blanket
    c. Fire extinguisher
    d. Gloves
    e. Laboratory coat
    f. Safety glasses
    g. Safety shower

7. Distinguish between class A, B, and C fire extinguishers and describe use of each, as assigned.
8. Describe or demonstrate proper technique for cleaning up spilled chemicals, including concentrated acids, caustics, toxic compounds, and infectious agents, as assigned.
9. Locate and use appropriate MSDS sheets in the use, disposal, and cleanup of chemicals.
10. Develop laboratory techniques that consistently adhere to established safety practices.

Section II: Review of Immunology and Genetics

Upon completion of these units, the student will be able to:

Unit A: Immunology

1. Demonstrate understanding of the following terms, as used in immunohematology:

    a. Alloantibody
    b. Antibody
    c. Antigen
    d. Autoantibody
    e. Complement
    f. Hemagglutination
    g. Sensitization
    h. Specificity

2. Describe physical and chemical characteristics of antigens.
3. List and describe the classes of immunoglobulins.
4. Describe the physical and chemical characteristics of IgG and IgM.
5. Apply the following terms to immunity:

    a. Active
    b. Artificial
    c. Natural
    d. Passive

6. List and describe the two stages of agglutination.

Section II, Unit A, continued:

7. Explain the effects of each of the following on antigen- antibody reactions.

   a. Antigen-antibody ratio
   b. Ionic strength
   c. Number of antigen sites
   d. pH
   e. Temperature
   f. Zeta potential

Unit B: Genetics

1. Demonstrate understanding of the following terms:

   a. Allele
   b. Codominant
   c. Dominant
   d. Genotype
   e. Heterozygous
   e. Homozygous
   h. Locus
   i. Phenotype
   j. Recessive

2. Relate the concept of independent assortment to blood group systems.
3. Given typing results for a given blood group system, correctly write the phenotype and possible genotypes.

Section III: Blood Group Systems

Upon completion of these units, the student will be able to:

Unit A: The ABO system

1. List the antigens and antibodies of the system.
2. State the optimal conditions for reactions.
3. Discuss subgroups of A.
4. Explain the importance of the ABO system in blood transfusion therapy.
5. Discuss the inheritance of the ABO system, including genes, transferases, and terminal carbohydrates.
6. Outline how each of the common ABH antigens is constructed.
7. List the relative concentration of H substance on the RBCs of each of the ABO groups.
8. Relate the Sese system to the ABO and Hh systems.

Unit B: Rh System

1. List the common antigens of the system, using Fisher-Race, Rosenfield, and shorthand nomenclature.
2. Compare the genetic theories underlying the systems of nomenclature.
3. Describe the relative antigenicity of the various Rh antigens.
4. State the optimal conditions for Rh system reaction.
5. Discuss the Rh variant weak D, the use of weak D positive donor blood, and the transfusion of weak D positive patients.
6. Given the results of Rh typing, record the phenotype and possible genotypes.

Unit C: Other Blood Group Systems

1. Define blood group system.
2. Define public and private antigens.

Section III, Unit C, continued:

3. For the blood group systems MNSs, I, P, Kell, Duffy, Kidd, Lewis, Lutheran, Xg:

    a. Describe the gene and antigen nomenclature.
    b. State the class of system antibodies.
    c. State the reaction characteristics of antibodies in the system.
    d. Discuss the clinical significance of the system.

Section IV: Laboratory Techniques

Upon completion of these units, the student will be able to:

Unit A. General Testing

1. Follow safety rules in the laboratory, as previously instructed and practiced.
2. Follow established laboratory procedures, including reading and following directions, using correct samples, preparing samples for testing, and recording and interpreting test results.
3. Given a blood sample and a test request, correctly assess the suitability of the sample for analysis, including sample labeling, type, volume, and presence of reasons for rejection, such as hemolysis or collection in a gel tube.
4. Separate serum or plasma from RBCs, as assigned, including correct labeling of transfer tubes.
5. Correctly prepare cell suspensions of a given concentration.
6. Use proper techniques to wash a cell suspension, by manual and automated methods.
7. Correctly read, grade, and record agglutination reactions.
8. Discuss how methods of tube agitation can influence test results.
9. Examine and interpret agglutination reactions microscopically, as assigned.
10. State the purpose of the agglutination viewer, and demonstrate its use.
11. Describe six grades of agglutination.
12. Interpret hemolysis, when seen in a reaction.
13. Explain the importance of recording reactions as they are read.

Unit B: Antigen Typing and Phenotyping

1. Perform routine ABO and Rh tube typing, recording and interpreting results.
2. Discuss and perform testing to differentiate between A_1 and A_2.
3. State the difference between forward (cell) and reverse (serum) ABO typing.
4. Recognize discrepancies in ABO typing results, such as disagreement between cell and serum testing, mixed field results, and/or weak agglutination.
5. Explain the purpose and correct use of Rh control serum.
6. Perform the test for weak D, when indicated.
7. Differentiate between the following types of Rh antisera:

    a. Chemically modified
    b. Saline
    c. Slide and modified tube test
    d. Monoclonal

9. Perform the tests for other common Rh antigens.
10. Recognize discrepancies in Rh typing results, such as mixed field reactions, weak reactions, and/or positive Rh control tube.
11. Test for other blood group antigens, as assigned.

Section IV, Unit C: Antiglobulin Testing

1. Explain the principle of the antiglobulin reaction.
2. List and discuss the applications of the direct antiglobulin test.
3. List and discuss applications of the indirect antiglobulin test.
4. Define antihuman globulin, including:

    a. Poly specific (broad spectrum) AHG
    b. Anti-IgG
    c. Anti-C3d
    d. monoclonal
    e. polyclonal

5. Outline a system of control for antiglobulin tests.
6. Given a set of reaction conditions, indicate whether they would cause false positive or false negative reactions in antiglobulin testing.
7. Outline a procedure for screening for atypical antibodies.
8. Discuss the significance of antibody screening in donors and recipients.
9. Perform antibody screens, including correctly interpreting and reporting results.
10. Perform direct antiglobulin tests, including correctly interpreting and reporting the results.
11. Given a sample with a positive DAT, test it with anti-IgG and anti-C3d, as assigned, including correctly interpreting and reporting results.

Unit D: Compatibility Testing

1. Explain the purpose of compatibility testing.
2. List the parts of the compatibility test and explain the purpose of each.
3. State the limitations of the compatibility test.
4. Differentiate between a major and minor crossmatch.
5. Select appropriate donors for a given recipient.
6. Discuss the importance of clerical accuracy.
7. Perform routine compatibility testing, interpreting and reporting the results correctly.
8. List, for each ABO and Rh type, alternative blood types that may be transfused when type specific blood is not available.
9. Discuss the role of the type and screen procedure in eliminating unnecessary crossmatching.
10. Outline the procedure for provision of appropriate blood for a patient with a history of and/or currently detectable antibody.
11. Explain why the crossmatch can be abbreviated safely when there is no history of or currently detectable antibody.
12. Discuss conditions under which the crossmatch can be performed via computer.

Unit E: Antibody Identification

1. Define a panel of cells.
2. Given the results of an antibody screening test, outline how he/she would identify the antibody, including:

    a. Check patient history
    b. Consider temperatures and media of reactions
    c. Type patient RBCs for corresponding antigen(s)

3. Perform antibody identification tests, including, where necessary:

    a. Adding proper amounts of cells, serum, and other reagents
    b. Correct reading and recording of results
    c. Correct interpretation of results
    d. Incubation of tubes under proper conditions and for correct amount of time
    g. Correct interpretation of results

Section IV, unit E, continued:

4. Given the results of an antibody identification panel, identify the antibody or antibodies present.
5. Suggest, and perform where possible, confirmatory tests, including typing patient's cells for corresponding antigen(s).
6. Recall the expected reactions of each antibody under each set of conditions, using this information to interpret test results.
7. Discuss the clinical significance of an identified antibody.
8. Determine if an identified antibody is an autoantibody or alloantibody.
9. Explain the purpose of antibody titers, and perform an antibody titration, if assigned.

Section V: Clinical Correlation

Upon completion of these units, the student will be able to:

Unit A: Hemolytic Disease of the Newborn

1. Explain the mechanism of sensitization of the infant's RBCs.
2. Contrast ABO HDN, Rh HDN, and HDN due to other antibodies.
3. Discuss methods of treatment for HDN.
4. Outline a method of prenatal screening to predict and monitor possible HDN.
5. Describe the investigation of cord bloods.
6. Perform prenatal and cord blood studies, as assigned.
7. State the significance of antibody titers in prenatal studies.
8. Discuss the use of Rho(D) immune globulin to prevent Rh sensitization.
9. State requirements for a candidate to receive Rho(D) immune globulin.
10. Perform preliminary testing of Rho(D) immune globulin candidates, and correctly interpret the results.
11. Discuss the use of tests to estimate fetomaternal bleed and the calculation of dosage of Rho(D)
    immune globulin.
12. Perform and interpret a test for estimation of fetomaternal bleed.

Unit B: Transfusion Reactions

1. Define the types of transfusion reaction, including:

a. Alloimmunization	f. Hemolytic
b. Anaphylactic	g. Post transfusion purpura
c. Bacterial	h. Transfusion related acute lung injury
d. Delayed	i. Transmission of disease
e. Febrile	j. Urticarial

2. Propose ways to avoid each type of reaction (if it can be avoided).
3. Outline a procedure for investigation of a suspected transfusion reaction.
4. Perform tests involved in the investigation of a suspected transfusion reaction, including interpreting and reporting results.
5. Relate tests performed in other laboratory departments to investigation of suspected transfusion reactions.
6. Discuss the importance of absolute clerical accuracy in preventing transfusion reactions.

Section V, Unit B, continued:

7. Differentiate between hepatitis A, hepatitis B, and hepatitis C with respect to the following criteria:

    a. Carrier state
    b. Degree of jaundice
    c. Modes of transmission
    d. Morbidity and mortality
    e. Relation to transfusion
    f. Serologic markers
    g. Time of incubation

8. Discuss other diseases that can be transmitted by transfusion, including HIV, HTLV, cytomegalovirus, malaria, and other parasites.

Section VI: Collection, Preservation, Storage, and Use of Blood and Blood Components

Upon completion of these units, the student will be able to:

Unit A: Donor Selection and Care

1. List and explain criteria for donor selection.
2. Outline physical requirements for the donor.
3. Outline a procedure for preparing the donor arm for phlebotomy.
4. Describe the collection of a unit of whole blood.
5. Discuss care of the donor after phlebotomy, including possible reactions.
6. Describe how routine procedures may be modified in the following situations:

    a. Autologous donation
    b. Pheresis
    c. Directed donation
    d. Therapeutic phlebotomy

Unit B: Processing the collected unit

1. List and compare anticoagulants used in blood donation.
2. Describe blood component additives and rejuvenating solutions, relating them to blood storage and outdating.
3. Discuss the tests performed on a unit of blood before release for transfusion or component preparation.
4. List information required on a blood unit label.

Unit C: Component Preparation and Therapy

1. Outline how the following components are prepared and stored:

    a. Cryoprecipitate
    b. Fresh frozen plasma
    c. Frozen-thawed RBCs
    d. Granulocytes
    e. Leukocyte reduced RBCs
    f. Platelet concentrate
    g. Red blood cells
    h. Single donor plasma
    i. Washed RBCs
    j. Whole blood

2. List indications for transfusion of the components listed above.
3. Given a hypothetical clinical situation, select appropriate component therapy and justify the choice.
4. Discuss problems involved with massive transfusion of blood, and how component selection can minimize the problems.
5. List biochemical changes which occur during storage of components.
6. List advantages to the use of solvent-detergent plasma.

Section VI, Unit C, continued:

7. Discuss advantages and disadvantages of single-donor vs. random pooled platelet concentrates.
8. Explain the advantages of leukocyte-reduced components.
9. Discuss situations in which the use of irradiated components is appropriate.

Section VII: Quality Assurance

Upon completion of this section, the student will be able to:

1. Demonstrate the appropriate quality control procedures for monitoring daily and non-routine test results.
2. Maintain accurate quality control records.
3. Describe and demonstrate appropriate equipment control and daily maintenance procedures including the following, as assigned:

    a. Centrifuges
    b. Glassware
    c. Timers
    d. Pipettes
    e. Refrigerators and freezers
    f. Water baths and heating blocks

4. Perform periodic maintenance and performance checks on centrifuges and cell washers, as assigned.
5. Describe how the following assist in maintaining quality assurance:

    a. Education
    b. Procedure manual
    c. Proficiency Testing (external QC)
    d. Competency assessment of personnel

HEMATOLOGY

CLLS 230

Fall 2004

COURSE DESCRIPTION:

The student will learn the principles, concepts and techniques of blood cell analysis and the concepts of blood cell pathology and their application in a clinical laboratory.

Credits: 3

Configuration: 2 lecture hours + 4 lab hours per week

Instructor: Sandy Cook, M.S., MT(ASCP)

Telephone: LAB: 591-2268 OFFICE: 591-2314

E-mail: cooks@ferris.edu

Office Hours: Please see me to arrange a time, as needed.

Pre-requisite: BIOL 205 (or equivalent) and CHEM 124 or 214 (or equivalent)

Course Materials:

Required:

Clinical Laboratory Hematology, McKenzie, Prentice Hall, 2003.

Hematography Plus, Lofsness, U. of Minnesota, 2000 (CD-ROM)

CLLS 230 Course Pack (available at Lundberg Bookstore)

Additional Recommended Resources (not required):

Clinical Hematology Atlas, Carr & Rodak, Elsevier Saunders, 2004.

Laboratory Supplies :

Black Sharpie. A permanent marker capable of marking test tubes is needed. Black is preferable because it is the most easily visible on the materials that we will use. Save yourself grief and leave the colored ones at home!

Approved lab coat. This means that the lab coat is a disposable paper coat that has cuffed sleeves and snaps close in the front. These are available for purchase at Lundberg Bookstore – see Karen in the school supply section.

CLASS POLICIES:

Attendance

A. **College Policy:** The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion

as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. **CLS Attendance & Promptness Policy:** Attendance will be taken at the beginning of each lecture session. Please make the effort to attend every class session and be on time. Lecture begins at 17:00 on Monday & Wednesday, and labs will follow at 18:00. I expect to see you present, with materials available, and ready to go. If you're not, expect to lose points for any assignment that you missed or began late. If you miss more than 3 lecture periods during the semester, your final grade will be dropped by one half letter grade.

C. **If you must miss a lab or class**: telephone IN ADVANCE and leave a message.

Acceptable excuses include: illness, weather emergency (when local law enforcement recommends staying off the roads – valid only for commuters), death in the family, required court appearances, and university-sponsored events with an excused absence form.

If you miss class with an excuse reported ahead of time: See the instructor. I'll figure out a way for you to learn the content that you missed. If you missed lab, I'll have to schedule a time for you to make it up.

Guidelines for student conduct in class & lab:

A. Be on time and ready to start.

B. During lab, wear your lab coat (buttoned), shoes with closed toes and heels (wear socks, too), long pants/skirts (NO shorts), and your nametag. You must be using the appropriate personal protective equipment while doing lab exercises.

C. Bring your calculator EVERY TIME. Forgetting it doesn't mean you don't have to calculate, it means YOU HAVE TO CALCULATE WITHOUT IT.

D. Clean up after yourself.

E. Cooperate with the instructor & your fellow classmates.

F. Have fun, and learn all you can.

G. NO CELL PHONE USE DURING CLASS OR LAB!!!

General Course Policies: This course will follow the general policies of the University and the College of Allied Health Sciences.

A. **ADA**: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

B. **Harassment**: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

C. **Religious Holidays**: For the policy, refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm

D. **Disruptive Student Policy**: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

E. **Plagiarism & Academic Honesty Policy**: Refer to the CLS student handbook. Cheating and plagiarism

will not be tolerated. Plagiarism is the use of someone else's thoughts and ideas and using it as one's own work. If you need help in properly citing materials that you are using, contact the Writing Center for assistance. Their web page is: http://www.ferris.edu/htmls/academics/departments/writingcenter/homepage.htm

COURSE EVALUATION:

This course will be evaluated based on both lecture and lab knowledge. There will be 3 exams (including the final), approximately 11 quizzes, lab exercises, and 2 lab practicals. Assorted homework assignments will be given throughout the semester.

Exams = 100 points each (40%)

Quizzes = 20 points each (10%)

Lab Exercises = 5 points each (20%)

Lab Practicals = 50 points each (30%)

Grade	%	Grade	%	Grade	%	Grade	%
A	93-100	B	83-86.9	C	73-76.9	D	63-66.9
A-	90-92.9	B-	80-82.9	C-	70-72.9	D-	60-62.9
B+	87-89.9	C+	77-79.9	D+	67-69.9	F	< 60

Reminder: A grade of less than a C may result in repeating the course (See CLS Handbook).

CLLS 230	TENTATIVE SCHEDULE		FALL 2004
DATE	**LECTURE**	**LAB**	**READING ASSIGNMENTS**
M 8/30	Intro to the Course	Safety, lab rules, etc…	Chapter 1
W 9/1	Hematopoiesis	Intro to the microscope and blood slides	Chapter 3
M 9/6	Labor Day -- No Class!!		
W 9/8	Hematopoiesis	Making smears, manual hemaocrits	Chapter 2
M 9/13	RBC Structure & Function	Smear & hematocrit practice **Quiz 1 - hematopoiesis**	Chapter 4 Hematography Plus CD
W 9/15	More RBCs & Hemoglobin	Unopette RBC, smears	Chapter 5
M 9/20	Normal WBCs	Unopette WBC, practice diffs **Quiz 2 – RBCs & Hgb**	Chapter 6 Hematography Plus CD
W 9/22	Normal WBCs	Normal cases, Unopette WBC	Chapter 6
M 9/27	**EXAM I**	Normal Diffs	
W 9/29	RBC Morphology	RBC Study Slides, Sed Rates	Chapter 10
M 10/4	RBC Morphology	RBC Study Slides **Quiz 3 – RBC ID & function**	Chapter 10
W 10/6	Intro to Anemia	Lab Math, Instrumentation, Retic Counts	Chapter 10
M 10/11	Iron Associated Disorders	RBC Study Slides **Quiz 4 – RBC morph & intro to anemia**	Chapter 11
W 10/13	Hemoglobinopathies	**LAB EXAM I**	Chapter 12
M 10/18	Thalassemias	RBC Study Slides, Sickle Preps **Quiz 5 – IDA & hemoglobinopathies**	Chapter 13
W 10/20	Macrocytic Anemias & Hypoproliferative Disorders	Bone Marrow discussion and bone marrow slides.	Chapters 9, 14, & 15.

M 10/25	Hemolytic Anemias	RBC Study Slides **Quiz 6 – Thalassemia, macrocytic & hypoproliferative anemias**	Chapters 16 - 20
W 10/27	Hemolytic Anemias	RBC Study Slides, Retics	Chapters 16 - 20
M 11/1	**EXAM II**	Instrumentation	
W 11/3	Non-malignant WBC Disorders	WBC Cases	Chapter 21
M 11/8	Non-malignant WBC Disorders	WBC Cases **Quiz 7 – WBC ID & function**	Chapter 22
W 11/10	Introduction to Neoplasms	WBC Cases, Instrumentation	Chapter 26
M 11/15	Myeloproliferative Disorders	Cases **Quiz 8 – non-malignant WBCs & intro to neoplasms**	Chapter 27
W 11/17	Myelodysplastic Syndromes	Cases	Chapter 28
M 11/22	Acute Myelocytic Leukemias	Cases **Quiz 9 – MPD & MDS**	Chapter 29
W 11/24	Acute Lymphocytic Leukemias & Chronic Lymphocytic Leukemias	Cases	Chapter 30 & 31
M 11/29	Other Lymphoid Disorders	Cases **Quiz 10 -- AML**	Chapter 31
W 12/1	New Topics in Hematology	Cases	
M 12/6	New Topics in Hematology	Cases **Quiz 11 – Lymph disorders**	
W 12/8	Wrap Up	**LAB EXAM II**	
Finals Week	**Cumulative Final Exam**		

Please be flexible – this schedule may be subject to changes as we go through the semester!!

Course Objectives

At the completion of the course, the student will be able to complete the objectives for each of the following lecture topics:

Introduction to Hematology

- Define the following: hematology, whole blood, plasma, serum
- List the major functions of the blood.
- Name the 3 major cell types found in the peripheral blood and state the major function of each.
- Name the anticoagulant of choice for most routine hematology tests and explain how it functions as an anticoagulant.
- Discuss why most hematology assays require anticoagulated specimens.

Hematopoiesis

- Define the following as they relate to blood cell derivation: hematopoiesis, erythropoiesis, leukopoiesis, thrombopoiesis, extramedullary, medullary, stem cell pool, committed pool, uncommitted pool, CFU, CIF, erythropoietin, thrombopoietin, amplification, differentiation, proliferation, maturation, cytokines, pluripotential stem cell, apoptosis
- For each of the following: embryo, fetus, infants, young children, adults
    - Identify the different phases of hematopoiesis & cellular development.
    - Identify the location of hematopoietic tissue.
- Explain the role of other organ systems in hematopoiesis, including the liver, spleen, lymph nodes, thymus, and bone marrow.
- Associate the following physical findings with hematologic disease: splenomegaly, hepatosplenomegaly, hypersplenism, lymphadenopathy

Erythropoiesis and RBC Metabolism

- Describe the maturation sequence of the erythrocyte, including the nuclear & cytoplasmic features used to characterize each stage.
- Identify each stage of the developing erythrocyte on clinical specimens & electronic images.
- List the expected range for reticulocytes. Explain the functional and clinical significance of reticulocytes.
- Explain the role of the following substances in erythropoiesis: erythropoietin, iron, Vitamin B12, folic acid, intrinsic factor.
- List the hormones associated with erythropoiesis.
- Describe the composition & function of the erythrocyte membrane, and explain how it influences erythrocyte survival.
- Describe the metabolic pathways used in providing the erythrocyte with energy.
- Diagram the intravascular and extravascular pathways used in the destruction of erythrocytes, and define the terms used in the various stages of the pathway.

Hemoglobin

- Define the following terms: hemoglobin, deoxyhemoglobin, methemoglobin, oxyhemoglobin, carboxyhemoglobin, sulfhemoglobin
- List and discuss the three major functions of hemoglobin.
- Describe and recognize the sites of hemoglobin production in cells.

- Diagram the biochemical structure of the hemoglobin molecule, including globin chains, heme, and iron.
- List the globin chains found in each of the following and state when each appears and/or disappears: Gower, Portland, Hemoglobin A, Hemoglobin A2, and Hemoglobin F.
- State the relative quantities that each of the above hemoglobins present in the embryo, newborn, and adult.
- State the expected range of hemoglobin for newborns, adult males, and adult females.
- Describe how hemoglobin transports and releases oxygen.
- Diagram a normal oxygen dissociation curve (ODC).
- Explain how pH, temperature, 2,3-DPG, and the PO_2 affect the ODC.

Leukopoiesis

- List the reference ranges for the total WBC count in newborns, children, and adults.
- Define absolute and relative counts. Calculate absolute values when given a total WBC count and differential results.
- List the reference ranges for the absolute and relative values of the following: neutrophils, lymphocytes, monocytes, eosinophils, basophils.
- Identify factors that may alter leukocyte values.
- Describe the morphology used to differentiate developing leukocytes.
- Describe the immunological features of leukocyte precursors in the bone marrow.
- Describe the maturation sequence and features of developing cells in each of the following cell lines: granulocytic, monocytic/macrophage, lymphocytic.
- Compare and contrast the function of the WBCs found normally in the peripheral blood.
- Explain how neutrophils perform the process of phagocytosis.
- Explain the function(s) of neutrophils, eosinophils, and basophils.
- Describe the maturation process of the lymphocyte, including both B and T cells.
- Describe the maturation process of the monocyte.

Red Blood Cell Morphology

- Describe the size and appearance of a normal, mature erythrocyte
- Describe and identify specific ansiocytes and poikilocytes.
- Calculate erythrocyte indices when given values for total RBC count, hemoglobin, and hematocrit. Explain possible sources of error for indice values.
- Classify erythrocytes based on calculated indices.
- Describe the appearance and composition of erythrocyte inclusions.
- Identify specific erythrocyte inclusions and list the stains used to make them microscopically visible.
- Explain the importance of enumerating reticulocytes.
- Calculate an absolute reticulocyte count and the reticulocyte production index when given a reticulocyte count, hematocrit, and total RBC count.

Survey of Erythrocyte Disorders

- General Characteristics of Anemia
  - Define anemia.
  - Explain the two general reasons an anemia may develop.
  - Describe the physical symptoms seen in patients with anemia.
  - Describe the laboratory screening tests used to determine if anemia is present (CBC, peripheral blood smear).
  - Classify anemias using a morphologic classification.
  - Classify anemias by function (survival, maturation, and proliferation defects).

- Disorders of Iron Metabolism
  - Define sideropenic and sideroachrestic anemia.
  - Describe the metabolism of iron in the body as it relates to hemoglobin production, including transport and storage functions.
  - Define the following: transferrin, ferritin, hemosiderin, TIBC, UIBC.
  - Describe the iron requirements and physical conditions that affect the amount required by the body.
  - Describe the clinical features and peripheral blood picture exhibited by patients with iron deficiency anemia.
  - Describe the types of therapy used in cases of iron deficiency anemia.
  - Compare and contrast the three stages of iron deficiency anemia.
  - Describe the classification of sideroblastic anemias and list causes for each type.
  - Describe the peripheral blood picture exhibited by patients with sideroblastic anemia.
  - Describe the anemia of chronic disease and the peripheral blood picture seen in this condition.
  - Define the clinical features and peripheral blood picture exhibited by patients with hemochromatosis.
  - Compare and contrast the expected results of iron studies for iron deficiency anemia, sideroblastic anemia, anemia of chronic disease, and hemochromatosis.
  - Define porphyria.
  - List the excess metabolites found in patients with porphyries.

- Hemoglobinopathies
  - Define hemoglobinopathy
  - Explain why an altered hemoglobin may cause clinical signs of disease.
  - Explain how hemoglobin electrophoresis is used to identify abnormal hemoglobins.
  - List the mutation present in the following hemoglobins: C, D, E, S
  - Describe the epidemiology of sickle cell anemia and compare it to the other hemoglobinopathies.
  - Describe the clinical features and peripheral blood picture exhibited by patients with hemoglobinopathies. Specifically discuss sickle cell anemia, sickle cell trait, Hemoglobin SC disease, Hemoglobin C disease, Hemoglobin D disease, and Hemoglobin E disease.

- Thalassemias
  - Define thalassemia.
  - Compare and contrast qualitative and quantitative hemoglobin defects.
  - Compare and contrast α and β thalassemia.
  - List the 4 genotypes of α thalassemia and describe the clinical features, peripheral blood picture, laboratory results, and the number of alleles affected.
  - List the genotypes of β thalassemia and describe the clinical features, peripheral blood picture, laboratory results, and the number of alleles affected.

- Macrocytic Anemias
  - Describe the physiological requirements for vitamin B12 & folate and explain its role in erythrocyte maturation.
  - Define megaloblastic anemia and describe what happens in the cells of patients with this condition.
  - Describe the clinical features, peripheral blood picture, and other laboratory results seen in patients with vitamin B12 or folate deficiency.
  - Compare and contrast pernicious anemia with vitamin B12 deficiency.
  - Explain other causes of non-megaloblastic, macrocytic anemias

- Hypoproliferative Anemias
    - Define hypoproliferative anemia.
    - Discuss the possible causes of aplastic anemia.
    - Describe the clinical features, peripheral blood and bone marrow picture and other laboratory results seen in patients with aplastic anemia.
    - Differentiate between aplastic anemia and pure red cell aplasia.

- Hemolytic Anemias
    - Define hemolytic anemia.
    - Discuss the various causes of a hemolytic anemia for both inherited and acquired states.
    - Describe the clinical features, peripheral blood picture and other laboratory results seen in patients with hemolytic anemia.
    - Discuss the hemolytic anemias based on the following classifications: membrane defects, enzyme deficiencies, immune defects, and non-immune defects.

Non-malignant Leukocyte Disorders

- Recognize the common disorders associated with abnormalities of leukocytes (increased & decreased numbers) given hematologic data.
- Explain how neutrophils respond to acute bacterial infections.
- Explain how lymphocytes respond to viral infections.
- Identify cytoplasmic changes seen in reactive neutrophils, including toxic granulation, Dohle bodies, vacuoles, and intracellular organisms.
- Identify nuclear alterations and recognize the conditions in which they may be seen, including Pelger-Huet, hypersegmentation, and pyknosis.
- Describe a reactive lymphocyte and explain what conditions it may be seen in.
- Describe the abnormal hematologic findings associated with HIV.
- Define the following terms: leukemoid reaction, leukoerythroblastosis, morulae, Alder-Reilly Anomaly, Chediak-Higashi Anomaly, May-Hegglin Anomaly, Gaucher Disease, Niemann-Pick Disease, myelophthisis, shift to the left, reactive lymphocytes

Hematologic Neoplasms

- Intro to Hematologic Neoplasms
    - Explain the different ways hematologic malignancies can be classified
    - Compare the differences between acute and chronic leukemias
    - Explain the use of special techniques for diagnosis, prognosis, and treatment of hematologic neoplasms, including cytochemical stains, chromosomal analysis, immunological techniques, and molecular analysis.
    - Explain the significance of performing immunophenotyping on specimens suspected to have a hematopoietic neoplasm.

- Myeloproliferative Disorders
    - For each of the following disorders identify laboratory findings seen in each, list the population most affected and discuss the prognosis: chronic myelocytic leukemia, polycythemia vera, essential thrombocythemia, and myelofibrosis with myeloid metaplasia.
    - Define Philadelphia Chromosome and explain its significance.
    - Define the following: blast crisis, leukemic hiatus
    - Explain what indicates the transformation of a myeloproliferative disorder into a blast crisis.

- Myelodysplastic Syndromes
    - Define dyspoiesis.
    - Explain what happens in the bone marrow of a patient with a myelodysplastic syndrome.

CLLS 355: Clinical Chemistry 2
Fall, 2005
Tentative Laboratory Schedule

Date	Lab Activity	Points
M 0829	Organize; get lab coat hook, locker assignments, etc. Get your team assignment	---
M 0905	**Labor Day: no lab**	---
M 0912	Review Analyzers	10
M 0919	Review Analyzers	10
M 0926	Review Analyzers	10
M 1003	Review Analyzers	10
M 1010	Within run replication	10
M 1017	Interference	10
M 1024	Comparison of methods	10
M 1031	Comparison of methods	10
M 1107	Comparison of methods	10
M 1114	Comparison of methods	10
M 1121	Comparison of methods	10
M 1128	Crunch numbers; come to conclusions	20
M 1205	Presentation about textbooks	40

CLLS 355: Advanced Clinical Chemistry
Course Objectives

Section I: Safety

Upon completion of this section, the student will be able to:

A. Apply knowledge of safe laboratory practice to all laboratory assignments.
B. Document review of chemical hygiene and blood borne pathogens safety training for the current academic year, as requested.
C. Correctly use equipment and procedures to assure safety, including:

1. Disposable gloves
2. Disinfectant cleaner
3. Hand washing
4. Laboratory coats

D. Leave centrifuges closed while running.
E. Dispose of glassware, contaminated samples, contaminated supplies, and other items correctly, as instructed.
F. Demonstrate or describe proper use of the following safety equipment, as assigned:

1. Eye wash station
2. Fire blanket
3. Fire extinguisher
4. Gloves
5. Laboratory coat
6. Safety glasses
7. Safety shower

G. Distinguish between class A, B, and C fire extinguishers and describe use of each, as assigned.
H. Describe or demonstrate proper technique for cleaning up spilled chemicals, including concentrated acids, caustics, toxic compounds, and infectious agents, as assigned.
I. Locate and use appropriate MSDS sheets in the use, disposal, and cleanup of chemicals.
J. Develop laboratory techniques that consistently adhere to established safety practices.

Section II: Reference Ranges

Upon completion of this section, the student will be able to:

A. Define reference range, subject-based reference values, and population-based reference values.
B. As assigned, define selection criteria for reference ranges.
C. As assigned, calculate reference ranges for analytes, using parametric and non-parametric measures.

Section III: Predictive Value Theory

Upon completion of this section, the student will be able to:

A. Given data for a specific test, calculate predictive values and the efficiency of the test.
B. Demonstrate how the prevalence of a disease state alters the predictive value of the test system.
C. Define the following terms:

1. Efficiency of a test
2. False negative
3. False positive
4. Predictive value of a negative result
5. Predictive value of a positive result

Section III, Unit C, continued:

6. Prevalence
7. Sensitivity of a test
8. Specificity of a test
9. True negative
10. True positive

D. Use predictive value calculations to reach conclusions about medical laboratory tests.

Section IV: Method Evaluation

Upon completion of this section, the student will be able to:

A. Define the following terms:

1. Allowable error
2. Correlation
3. Interference
3. Medical decision level
5. Range of reportable results (linearity)
6. Recovery
7. Reference range

B. Define the following types of error:

1. Constant systematic error
2. Proportional systematic error
3. Random error
4. Total error

C. For an assigned analyte, search the literature for or define medical decision levels.
D. For an assigned analyte, define allowable error at each medical decision level.
E. Write a working procedure for an analyzer or test system, as assigned.
F. As assigned, prepare training materials for introducing technologists to a new test system, and document training.
G. As assigned, perform recovery and interference experiments, calculate errors and compare results to allowable error for that analyte
H. Given the results from G above, come to conclusions about the acceptability of a test system.
I. As assigned, perform comparison of methods studies, including entering data into spreadsheets for later analysis.
J. As assigned, use the data gathered to calculate the following:

1. F (comparison of random error)
2. r (correlation coefficient)
3. Linear regression line
4. t (comparison of methods)
5. Total error

K. Use the calculations above to make decisions comparing total error to allowable error for a test system.

Section V: Organ Systems Testing

Upon completion of this section, the student will be able to:

A. Renal Function Testing

1. Review the macroscopic and microscopic anatomy of the renal system.
2. Define the following terms:

    a. Clearance
    b. Glomerular filtration rate
    c. Hemodialysis
    d. Nephron

3. State the clinical laboratory tests used to assess renal function and the laboratory values associated with renal pathology.
4. As assigned, discuss the causes, symptoms, and laboratory results obtained with each of the following conditions:

    a. Acute nephritic syndrome
    b. Acute renal failure
    c. End stage renal disease
    d. Nephrotic syndrome
    e. Pyelonephritis
    f. Urinary tract obstruction

B. Liver Function Testing

1. Review the macroscopic and microscopic anatomy of the hepatic system.
2. Define the following terms:

    a. Cholestasis
    b. Cholecystitis
    c. Cirrhosis
    d. Jaundice
    e. Hepatitis

3. Review the major functions of the liver
4. List and discuss the enzymes synthesized in the liver, their functions and clinical significance.
5. Describe three specific patterns of liver cell injury and the causes and symptoms of each pattern.
6. Describe how certain drugs and toxins can induce liver damage.
7. Relate laboratory test values to liver disease states, as assigned.

C. Cardiac Function Testing

1. As assigned, review blood flow through the heart and lungs.
2. State the events that lead to an acute myocardial infarction.
3. Define the following terms:

    a. Angina
    b. Coronary artery disease
    c. Ischemia
    d. Plaque

Section V, C: Cardiac Function Testing, continued:

1. Relate the cardiac markers to various disease states, as assigned.
2. Compare and contrast the cardiac markers used in laboratory testing.
3. Define a clinical pathway, using cardiac markers and other procedures to facilitate diagnosis and monitoring of cardiac disease.

Section VI: Endocrinology

Upon completion of this section, the student will be able to:

A. Pituitary Hormones

1. Describe the structure and function of the pituitary gland.
2. List and describe the hormones synthesized by the anterior pituitary and those stored in the posterior pituitary gland.
3. State the peripheral effects of normal hormone release for each pituitary hormone assigned.
4. State the peripheral effects of increased and decreased hormone release for each assigned hormone synthesized or stored in the pituitary gland.
5. As assigned, describe specific laboratory tests used to assess pituitary function.
6. As assigned, investigate a pituitary hormone, and present the information gathered to colleagues

B. Thyroid Hormones

1. Review and describe the structure and function of the thyroid gland.
2. List hormones synthesized in the thyroid gland and state their functions.
3. Describe the synthesis, regulation, and metabolism of thyroid hormones.
4. State the effects of increased and decreased concentrations of thyroid hormones on TSH levels.
5. List and discuss the laboratory tests used to assess thyroid function.
6. Associate laboratory values with Hashimoto's disease, Graves' disease, thyroid antibodies, and hypothyroidism.
7. As assigned, investigate a thyroid hormone, and present the information gathered to colleagues.

C. Adrenocortical Function

1. Review the structure and function of the adrenal cortex.
2. Diagram the biosynthesis of adrenocortical hormones from cholesterol.
3. List hormones synthesized by each zone of the adrenal cortex, and state their functions.
4. As assigned, discuss the following disorders: Addison's disease, Cushing's disease, Conn's syndrome, and congenital adrenal hyperplasia.
5. List and discuss laboratory tests used to assess adrenocortical function.
6. As assigned, investigate an adrenocortical hormone, and present the information gathered to colleagues.

Section VI, continued:

D. Reproductive Hormones

1. Review the structure and functions of the female and male reproductive tracts.
2. Define the following terms: corpus luteum, gynecomastia, hirsutism, menopause, ovum, placenta, and polycystic ovary syndrome.
3. List hormones synthesized by the female and male reproductive tracts and their specific sites of synthesis.
4. State the functions of the hormones listed in #3 above.
5. Describe the effects of increased and decreased GnRH, LH, and FSH.
6. Discuss tests used to assess reproductive function.
7. As assigned, investigate a reproductive hormone, and present the information gathered to colleagues.

Section VII: Nutritional Assessment and Monitoring

Upon completion of this section, the student will be able to:

A. Describe the biochemical tests used to assess nutritional status.
B. As assigned, investigate a biomolecule used to assess nutritional status, and present the information gathered to colleagues.

Section VIII: Tumor Markers

Upon completion of this section, the student will be able to:

A. Define the following terms:

1. Cancer
2. Oncofetal antigen
3. Oncogene
4. Proto-oncogene
5. Tumor marker
6. Tumor suppressor gene

B. Discuss the clinical relevance of prostate-specific antigen and its use in the detection of prostate cancer.
C. Compare and contrast oncogenes and tumor-suppressor genes.
D. List hormones, carbohydrates, and other molecules that can be used as tumor markers.
C. As assigned, investigate a biomolecule used as a tumor marker, and present the information to colleagues.

CLLS 430 – Advanced Hematology — Winter 04

COURSE DESCRIPTION:

Advanced theory and laboratory techniques in hematology and hemostasis including abnormal hemoglobins, special stains, bone marrow differentials, diseases of the hematopoietic system and pathology, review of body fluid cell analysis and instrumentation in hemostasis.

CREDITS: 3 **CONFIGURATION:** 2 Lec + 4 Lab/week

INSTRUCTOR: Douglas L. Bitler, MT(ASCP)

TELEPHONE: LAB: 591-2268 **E-Mail:** bitlerdo@ferris.edu
HOME: (989) 382-5860 **or:** dbitler@umha.org

OFFICE HOURS:

Feel free to contact me for appointments.

PREREQUISITE: CLLS 230 or Equivalent

TEXTBOOK: *Clinical Laboratory Hematology*, McKenzie, et.al., Prentice Hall, 2003
Hematography Plus, Lofsness, 2000, U of Minn. Press, CD-ROM

EVALUATION:

3 Exams	= 300 pts
5 Quizzes @20 pts each	= 100 pts
Lab Reports	= 100 pts
2 Lab Practicals	= 100 pts
	600 pts

Grade	Pts	Grade	Pts	Grade	Pts	Grade	Pts
A	558-600	B	498-521	C	438-461	D	378-418
A-	540-557	B-	480-497	C-	420-437	D-	360-377
B+	522-539	C+	462-479	D+	402-419	F	< 360

CLASS POLICIES:

Attendance

A. College Policy: The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the

College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. **CLS Instructor attendance policy:**

I **will** take attendance in this course. You're learning techniques to use on the job. When you leave Ferris for clinical experience, the instructors will expect that you have learned these procedures, and the theory behind them. Therefore, I expect you to attend every class. I also expect you to be here ON TIME. Think of this as your job. If you must be absent, as with a job, telephone IN ADVANCE and leave a message. If you don't, I will assume that you are absent due to lack of interest, and are also not interested in making up the quiz or lab. It is time to be serious about your work.

C. **CLS promptness policy:**

Class begins at 1500, and labs begin at 1600. We expect to see you present, with materials available, and ready to go. If you're not, expect to lose points for any assignment that you began late.

D. **If you must miss a lab or class**: telephone IN ADVANCE to the lab (231-591-2268) and leave a message.

E. **Acceptable excuses include:** illness, weather emergency (when the State Police recommends staying off the roads), death in the family, required court appearances, and trips made by you as a varsity athlete.

F. **Come to class.** Remember: you're paying to take this course. You might as well show up and get your money's worth.

G. **If you miss class with an excuse reported ahead of time:** See the instructor. I'll figure out a way for you to learn the content that you missed. If you missed lab, I'll have to schedule a time for you to make it up.

Guidelines for student conduct

A. Be on time and ready to start

B. Wear your lab coat, shoes with closed toes and heels, and your nametag.

C. Bring your calculator EVERY TIME. Forgetting it doesn't mean you don't have to calculate, it means YOU HAVE TO CALCULATE WITHOUT IT.

D. Clean up after yourself.

E. Cooperate.

F. Have fun, and learn all you can.

General Course Policies: This course will follow the general policies of the University and the College of Allied Health Sciences.

ADA: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to:
http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

A. Harassment: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

B. Religious Holidays: refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm for a copy of this policy.

C. Disruptive Student Policy: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

D. Plagiarism Policy: Plagiarism is a writer's use of someone else's words or ideas as his own without adequate and accurate acknowledgment of the source either copying word-for-word or paraphrasing or summarizing. Any instance of plagiarism will result in failing the course completely and may lead to referral to the department or university. (Just to demonstrate that we practice what we preach, we took this policy from the Department of Languages and Literature, the local experts. Refer to: http://www.ferris.edu/HTMLS/academics/Departments/langandlit/SYLE325.HTM.

CLLS 430 – Advanced Hematology
Tentative Schedule
Winter 2004

DATE		LECTURE	LAB
M	1/12	Hematology 1 Review	Hematology Procedure Review Manual Methods – PBC & Coulter
R	1/15	Hematology 1 Review	Hematology Procedure Review Retics and Diffs
M	1/19	**MLK Day – no lecture**	**MLK Day – no lab**
R	1/22	Hematopoiesis	Retics and Diffs - finish
M	1/26	Hematopoiesis	RBC Morphology
R	1/29	RBC Kinetics **Q1**	RBC Morphology
M	2/2	RBC Metabolism	Immature RBC Morphology -BM
R	2/5	Anemia – Iron	Hematology Instrumentation
M	2/9	Anemia –Iron	RBC Cases
R	2/12	Anemia - Megalo **Q2**	RBC Cases
M	2/16	Anemia – Hgbopathies	RBC Cases - Iron Stain
R	2/19	Anemia – Thal	RBC Cases
M	2/23	Anemia - Thal	RBC Cases- Fetal Hemoglobin Stain
R	2/26	Anemia - Hemolytic **Q3**	RBC Cases – Hemolytic
M	3/1	Anemia - Hemolytic	Finish RBC cases
R	3/4	**Exam #1**	**RBC Practical ****
	3/6	**to 3/14 Spring Break**	
M	3/15	WBC Abnormalities	WBC Cases Reactive
R	3/18	WBC Abnormalities	WBC Cases Reactive
M	3/22	WBC Abnormalities	WBC Cases Bone Marrow
R	3/25	Leukemia	WBC Cases MPD
M	3/29	Leukemia **Q4**	WBC Cases - MPD
R	4/1	Leukemia	WBC Cases - AML
M	4/5	Leukemia	WBC Cases –AML – PDX/NSE stain
R	4/7-9	**MSCLS meeting**	**MSCLS meeting**
M	4/12	Leukemia	WBC Cases - Lympho
R	4/15	Leukemia	WBC Cases – Lympho
M	4/19	Coagulation Review	Coag Instrument Rev
R	4/22	Body Fluid Cells **Q5**	Body Fluid Cases/Coag Instrument Rev
M	4/26	Body Fluid Cells	Body Fluids Cases
R	4/29	**Exam #2**	**WBC Practical ****
	??	**Comprehensive Final**	

**85% competency on cell morphology is required to pass, 1 retake is possible and 1/4 of the extra points are added to the first score.

Please be flexible – this schedule may be subject to changes as we go through the semester!!

CLLS 430
Advanced Hematology

Objectives

The CLLS 430 student is responsible for the course objectives from CLLS 230, Hematology.

Upon completion of the CLLS 430 course, the MT student will be able to:

I. Hematopoiesis

A. Discuss the normal production of peripheral blood cells to include:

1. Classification and identification of uncommitted and committed stem cells
2. Diagram the relationship between uncommitted and committed stem cells and their progeny.
3. Diagram the relationship between the major effectors/inhibitors and the production of peripheral blood cells.
4. Examine bone marrow preparations to:
   a. Evaluate cellularity, M:E ratio and storage iron
   b. Classify cell families present in the marrow.
   b. Recognize abnormal and atypical bone marrow cells.
   c. Correlate bone marrow findings with those present in peripheral blood.

II. Erythrocyte Kinetics

A. Describe the stimuli, rates of production and laboratory tests used to monitor RBC production.
B. Diagram the stages of development of the RBC from the earliest form to the the mature discocyte.

III. RBC Anatomy, Metabolism and Morphology

A. Diagram the structural biochemistry of the RBC membrane and cytoplasm
B. Diagram the major metabolic pathways needed by RBCs to function
C. Diagram the major catabolic pathways for destruction of hemoglobin and explain the diagnostic significance of abnormal concentrations of the metabolites.
D. Distinguish between the hemoglobin molecules found in the embryo, fetus, neonate and adult as well as the timing of production.
E. Explain the genetic coding for the different globin chains found at different developmental stages.
F. Diagram the structure of normal hemoglobin.
G. Relate the structure to the normal function of hemoglobin
H. Explain the role of effectors and inhibitors of the oxygen carrying ability of hemoglobin.
I. Relate the results of blood gas determinations to the functional ability of hemoglobin.
J. Identify the major RBC morphologic variants and relate the morphology to the micro-anatomy and biochemical variations in the RBC.

IV. Disorders of RBCs

A. Develop an algorithm for the classification of anemia by morphology or physiology.

B. Discuss the clinical findings, pathophysiology, biochemistry, laboratory findings, and treatment for the following types of anemia:

1. Anemia of defective heme synthesis
   a. Iron deficiency anemia
   b. Anemia of chronic disorders
   c. Sideroblastic anemias
   d. Lead intoxication
2. Anemia of abnormal globin biosynthesis
   a. Hemoglobinopathies
   b. Thalassemias
3. Abnormal nuclear development
   a. Megaloblastic anemias
   b. Congenital dyserythropoietic anemias
4. Hypoproliferative anemia
   a. Aplastic anemia
   b. Myelophthisic anemia
   c. Pure red cell aplasia
   d. Renal disease
5. Anemias of increased RBC destruction
   a. Hereditary hemolytic anemias
   b. Acquired non-immune hemolytic anemias
   c. Acquired immune anemias of increased destruction

V. Leukocyte Kinetics and Function

A. Describe the stimuli, rates of production and laboratory tests used to monitor WBC production.

B. Diagram the stages of development of the WBC from the earliest form to the the mature neutrophil, monocyte, eosinophil, basophil and lymphocyte.

VI. Disorders of Leukocytes

A. Nonmalignant Reactive Disorders

Discuss the clinical findings, pathophysiology, biochemistry, laboratory findings, and treatment for the following:

1. Neutrophils
2. Eosinophils
3. Basophils
4. Monocytes
5. Lymphocytes

B. Nonmalignant Hereditary Leukocyte Disorders

Discuss the clinical findings, pathophysiology, biochemistry, laboratory findings, and treatment for the following abnormalities:

1. Granulocyte morphology
2. Granulocyte function
3. Monocyte/Macrophage morphology and function
4. Immune leukocytes morphology and function

C. Myelodysplastic Syndromes

Discuss the clinical findings, pathophysiology, biochemistry, laboratory findings, and treatment for the myelodysplastic syndromes

D. Leukemia

Discuss the clinical findings, pathophysiology, biochemistry, laboratory findings, and treatment for the following forms of leukemia:

1. Acute myelocytic leukemia
2. Chronic myeloproliferative disorders
3. Acute lymphocytic leukemia
4. Chronic lymphocytic leukemia
5. Lymphomas

VII. Cytochemical Stains

1. Given an algorithm for classification of myeloproliferative disease determine the cytochemical stains needed for diagnosis.
2. Perform and evaluate the following cytochemical stains with proper QC:

   a. Iron
   b. Fetal Hemoglobin
   c. Peroxidase
   d. Non-Specific Esterase

VIII. Case studies

A. Given the initial CBC information and any additional needed clinical or lab test information:

1. Perform a microscopic blood cell analysis and determine the probable classification of hematologic disorder.
2. Determine the laboratory testing that may be needed by the physician to complete a diagnosis

B. Identify and resolve the major discrepancies that may occur in cell analysis
C. Identify normal, abnormal, nonsense and critical values in given sets of data for cell analysis
D. Correlate lab findings with disease states - Which disease fits these results?

IX. Instrumentation

A. Set-up, operate, shut down and maintain a single parameter electronic particle counter (Coulter Zf).
B. Set-up, operate, shut down and maintain a multiple channel electronic particle counter (Cell Dyn 3000).
C. Perform appropriate quality control procedures on the hematology analyzers
D. Correlate hemogram parameters with each other and with the peripheral blood film including discrepant results.
E. Evaluate instrument generated histograms and/or scatterplots and interpretive reports for diagnostic or QC purposes.
F. Identify sources of error and interfering substances, and alter procedures or sample to correct for the interference and/or perform alternate back-up methods
G. Discuss the principles of operation of the major automated cell analyzers available.

X. Body fluid cell analysis

A. Identify and classify cellular components on cytospin smears of:

1. CSF
2. Synovial fluid
3. Pleural fluid
4. Peritoneal fluid
5. Pericardial fluid

as seen in the major abnormalities of each fluid type.

B. Correlate the cell findings with the typical disorders of these body fluids

XI. Quality Assurance in Hematology

A. Discuss and perform methods for monitoring and controlling systematic error in hematology

B. Discuss and perform methods for monitoring and controlling random error in hematology

CLLS 435 Advanced Diagnostic Microbiology
Winter 2005 Session B

Credits: 4
Course Configuration: 4 + 10

Instructor: Daniel P. deRegnier, MS, MT(ASCP)
VFS 408, 591 - 2327
deregnid@ferris.edu

Office Hours: M: 10:00-11:00
T, R: 9:00 – 11:00
Other hours by appointment.

Course Description:

Advanced course covering the theoretical and laboratory aspects of clinical microbiology with an emphasis on pathogenic manifestations of disease in humans, correlation of laboratory data, quality assurance in the clinical laboratory, and extensive problem solving techniques used in the identification of clinical significant microorganisms. **Prerequisite**: CLLS 235 or my official okee-dokee

Lecture Schedule

M: 1:00 – 1:50
T,R: 12:00 – 1:15
Room 420

Laboratory Schedule

Weekday	Lab Time
Monday	9:00 – 11:50
Wednesday	9:00 – 10:50
Thursday	9:00 – 10:50
Friday	9:00 – 11:50

Lab will meet in room 421

Textbooks:

Required: *Textbook of Diagnostic Microbiology,* 2000, Mahon, Connie and George Manuselis, *2nd Ed, Saunders.* You should have this already

ASM Pocket Guide to Clinical Microbiology, 3rd, Murray, Patrick; ASM Press
You probably don't have this one, yet!

Evaluation:

I want to make sure that you are keeping up with the work, so I will post a quiz each Friday that will cover that material from the week just finished. The quizzes will be about 10-15 points. I will problably put them on a WebCT course.

This course will teach organism identification, from specimen processing to susceptibility testing, using a case-based approach. We will discuss many different specimen types in the context of a clinical case(s). You will receive two copies of each case, which also includes a set of study questions. One copy of the study questions will be turned in BEFORE the classroom session begins. They will NOT be accepted after I begin. The

second copy of the question set will be for you to make notes on. Each question set will be worth 10 points. I will return your original question set after I have graded them.

There will also be 4 lecture exams, about every other week. I don't know exactly how many points these will be worth because I haven't written them yet. They are usually around 50 points each.

Laboratory performance will be evaluated based on your ability to identify the organism(s) in the clinical specimens. Each one of you will have her/his own unknowns and will turn in your own work card. Each unknown will be worth 5 points. I don't know how many you will have. We'll have to wing it. I have the right to reduce or increase the number of unknowns.

Oh yeah, I almost forgot, YOU will also be doing a case study presentation. It will be worth 50 points. It will work something like this: you will draw, at random, from a container, the organism name and they order in which you will present. It may be a bacterium, viruses, fungus, or parasite. Then YOU will choose a body site in which your organism would be of clinical significance. Next, you will proceed to create a plausible case study and present it to the class using Microsoft PowerPoint. Your case presentation should have at least 6 no more than 10 slides. (We will have a lesson on using Microsoft PowerPoint, if necessary). You will have to include: patient history, other lab data if it is necessary, and information about your organism such as growth requirements, cultural characteristics, biochemical identification, clinical significance, mechanisms of pathogenicity, and antimicrobial susceptibility. Then you will supply, to your classmates, and me, 5 original, unique, and challenging questions. Mix up the style of question; in other words, don't write 5 True or False. You must include at least one short answer. You never know, I might just add some of these to the exams and quizzes (wink, wink, nudge, nudge, you know what I mean??). I will go through a sample case with you. These cases will be presented to the Supreme Being of Microbiology and, anyone else interested, during the last week or so of the course. They don't have to be very long, maybe 15 minutes with a few minutes at the end for questions (from me and your fellow students). We will also draw numbers for order of presentation. I am looking forward to this.

So, let's recap what we have so far:

Quizzes	15 points each	around 40 points (5%)
Question sets	10 points each	somewhere around 140 (17%)
Exams	about 50 points each	nearly 200 points (25%)
Unknowns	5 points each	close to 400 points (47%)
Case study presentation	50 points	exactly 50 points (6%)
Total		**Approximately 830 points**

Hmm, that should do it. Did I leave anything out? I know everyone is moaning and groaning about this case presentation. Well, stop your whining. It won't be that bad. I will give you more information later. If you want to get fancy, I may be able to get you some slides or at least some overheads to use. I'm looking forward to it... have I said that??.

Attendance:

This is an interesting and challenging course. Please make every effort to attend all class meetings. You will be responsible for all material handed out in lab and lecture. If you have to miss a lecture for any reason, please let me know ahead of time. Twenty-four hours would be nice, but I know that is not always possible. Call my office (591-2327) and leave a message...I have voice mail. I must have adequate notice (24 hours, if possible) if you are going to miss an exam. If you fail to show up for an exam or quiz without checking with me you will get a zero for that exam or quiz. No exceptions. The same goes for missing a lab. If you skip a lab without a reasonable excuse that was cleared through me ahead of time, you will not have the opportunity to make up that lab. My fragile ego will also be wounded. Due dates for assignments and lab exercises are included when the assignment is made. There will be one point deducted for each day the assignment is late. I routinely give hand outs at the beginning of lecture and lab. Once the class is over for the day, those handouts will no longer be available from me, so I suggest you come to class everyday. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family or your death.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

One more thing, HATS MAY NOT BE WORN DURING MICROBIOLOGY LABORATORY. .

I reserve the right to change any or all of the above.

GENERAL POLICIES:

Student Dignity

The University expects all students and employees to conduct themselves with dignity and respect for students, employees, and others. It is each individual's responsibility to behave in a civil manner and make responsible choices about the manner in which they conduct themselves. Harassment of any kind is ***not acceptable*** at Ferris State University. The University does not condone or allow harassment of others whether engaged in by students, employees, supervisors, administrators, or by vendors or others doing business with the University.

Harassment is the creation of a hostile or intimidating environment in which verbal or physical conduct, because of its severity or persistence, is likely to significantly interfere with an individual's work or education, or adversely affect a person's living conditions.

To assist with the understanding of what harassment is, this policy contains specific definitions of two of the more prevalent types of harassment – racial harassment and sexual harassment.

Harassment

Racial harassment includes any conduct, physical or verbal, that victimizes or stigmatizes an individual on the basis of race, ethnicity, ancestry, or national origin. Such behavior could involve
verbal conduct, intentional or otherwise, that has the purpose or effect of (or explicitly or implicitly threatens to) interference with an individual's personal safety, academic efforts, employment, or participation in University-sponsored activities.

The attributes of racial harassment described above are also the attributes of most other types of harassment that can occur. Harassment may be based upon a person's status that is protected by law (i.e., religion, veteran status, handicap, etc.), or may be for some other reason not specifically covered by law. In any event, harassment of any type is ***not acceptable*** at Ferris State University.

Sexual Harassment

Using the definition contained in the Equal Employment Opportunity Commission guidelines, adapted to include educational environments, sexual harassment is defined as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) submission to such conduct is made either explicitly or implicitly term or condition of an individual's employment or academic advancement;
2) submission to or rejection of such conduct by an individual is used as a factor in employment or academic decisions affecting such individuals;
3) such conduct has the purpose or effect of substantially interfering with an individual's work or academic performance, or creating an intimidating, hostile, or offensive working, living, or academic environment.

While sexual harassment most often takes place in situations of power differential between the persons involved, sexual harassment may also occur between persons of the same status, e.g., student-to-student. The person exhibiting sexually harassing conduct need not realize or intend the conduct to be offensive for the conduct to constitute sexual harassment.

Harassment Concerns

Any person who believes he or she has been subjected to harassment <u>of any kind</u> (sexual, racial, or otherwise) should approach the individual whom they believe is responsible. He or she should identify the specific behavior, explain that he or she considers the behavior to be offensive and/or harassing, and ask the individual to stop the behavior. If assistance is needed to approach the individual, contact either an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, or the Director of Affirmative Action.

If approaching the individual is not possible (i.e., you are uncomfortable or uncertain as to how the situation should be handled or concerned the situation may become volatile) or does not resolve the matter, it should then be reported immediately to an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, the Director of Student Judicial Services, or the Director of Affirmative Action. If, for some reason, you are uncomfortable discussing your situation with any of these individuals, please report your situation to any

member of University administration. The circumstances surrounding the matter will be fully investigated, including the nature of the harassment and the context in which it occurred.

All reports of harassment and subsequent investigations will be kept as confidential as possible. Anyone found to have violated this Policy will be subject to discipline up to and including discharge and dismissal that may include, but not be limited to, official reprimand, official apology, sensitivity training, and/or other disciplinary action including dismissal. Likewise, because intentionally false accusations of harassment can have serious effects on innocent people, anyone found to have intentionally falsely accused another person of violating this Policy will be subject to discipline up to and including discharge or dismissal.

Disruptive Behavior Policy Statement

The College of Allied Health Sciences strives to maintain a positive learning environment and educational opportunity for all students. Consequently, patterns of behavior which obstruct or disrupt the learning environment of the classroom or other educational facilities will be addressed.

1. The instructor is in charge of the course. This includes assignments, due dates, methods and standards of grading, and policies regarding attendance, tardiness, late assignments, outside conferences, etc.
2. The instructor is in charge of the classroom. This includes the times and extent to which they allow questions or discussion, the level of respect with which they and other students are to be treated, and the specific behaviors they will allow within their classes. Open discussion of an honest opinion about the subject of a course is encouraged, but the manner in which the class is conducted is a decision of the instructor.
3. If a student persists in a pattern of recurrent disruptive behavior, then the student may be subject to administrative action up to and including an involuntary withdrawal from the course, following administrative review by the Allied Health Sciences Dean's Office, and/or University disciplinary proceedings.
4. Disruptive behavior cannot be sanctioned by a lowered course grade (e.g., from a B to a C) except insofar as quality of classroom participation has been incorporated into the instructor's grading policy for all students. (Note: Academic misconduct, which is covered by other regulations, can be a legitimate basis for lowering a grade or failing the student.)
6. Students as well as employees are bound by the University's policy against harassment in any form. Harassment will not be tolerated.
7. The office of the student's dean will be notified of any serious pattern or instance of disruptive behavior.

Honesty Policy

The purposes of this policy are to encourage a mature attitude toward learning to establish a sound academic morale, and to discourage illegitimate aid in examinations, laboratory, and homework.

Cheating is defined as using or attempting to use, giving or attempting to give, obtaining or attempting to attain, products or prepared materials, information

relative to a quiz or examination or other work that a student is expected to do alone and not in collaboration with others. Plagiarism (copying) of themes or other written work shall also be considered an infraction.

Students are required to present the results of their own work except under circumstances in which the instructor may have requested or approved the joint effort of a number of students.

The penalty for the first offense of willful cheating consists of the student receiving a zero for the assignment in which the infraction occurs. However, cheating on quizzes or examinations means failure in the course. The student may appeal the decision to the Disciplinary Committee.

Further offenses may result in suspension or dismissal from the University.

Objectives:

At the end of this course, the student will be able to:

- ☺ List the common organisms associated with infectious disease of various human body sites.
- ☺ Discuss the antibiotic therapy common etiologic agents of infectious disease.
- ☺ Describe the importance of infection control in a clinical setting
- ☺ Create a case study for formal presentation

Lecture Schedule (Tentative)

Date	Topic
R, 3/3	Introduction/Upper Respiratory Tract
M 3/14	Upper Respiratory Tract/
T. 3/15	Lower Respiratory Tract
R, 3/17	Lower Respiratory Tract
M, 3/21	Urinary Tract
T, 3/22	Urinary Tract
R, 3/24	**Easter Break, No class**
M, 3/28	Gastrointestinal Tract
T, 3/29	Gastrointestinal Tract **Exam 1**
R, 3/31	Blood Cultures
M, 4/4	Blood Cultures
T, 4/5	Central Nervous System Cultures
R, 4/7	Central Nervous System Cultures **Exam 2**
M, 4/11	Skin and Tissue Cultures
T, 4/12	Skin and Tissue Cultures
R, 4/13	Genital Tract Cultures
M, 4/18	Genital Tract Cultures
T, 4/19	Infection control **Exam 3**
R, 4/20	**No Class: MSCLS Meeting**
M, 4/25	Cases: 1, 2, 3, 4
T, 4/26	Cases 5, 6, 7, 8
R, 4/28	Cases: 9, 10, 11, 12
	Final Exam

CLLS 456: Clinical Laboratory Practicum

I. Course Information

Meeting Times: 1400 – 1750 TWR beginning September 9, 2004

Credit Hours: 3 **Course Configuration:** 0+12

Course Description: Ten-week course for students in the 2+2 integrated medical technology program. Students apply previously acquired theory and techniques in a simulated clinical laboratory, with emphasis on work organization, correlation of results, management, decision-making, and quality assurance.

Prerequisites: CLLS 224, 225, 351, 355, 430, 435, 459 or equivalents.

II. Instructors:

Name	Sandra Cook	Daniel deRegnier	Barbara Ross
Credentials	MS, MT(ASCP)	MS, MT(ASCP)	MS, MT(ASCP)
Office	VFS 427	VFS 408	VFS 303
Phone	591.2314	591.2327	591.2317
E-mail	Cooks@ferris.edu	deregnid@ferris.edu	rossb@ferris.edu

III. Required books: NONE! We recommend that you seriously consider buying one or more review books for the certification exam. We'll talk about that as we go on.

IV. Course objectives: see the end of this syllabus

Course goals: The CLS Program Goals are found in the CLS Student Handbook. (www.ferris.edu/cls). Goals for this course are to provide you with opportunities to:

1. Practice safe laboratory procedures, applying knowledge of blood borne pathogens and chemical hygiene.
2. Develop technical competence, including the ability to integrate theory and practice.
3. Test reagents for expected reactivity, and to maintain instruments in common use in the clinical laboratory.
4. Evaluate the suitability of samples submitted for testing.
5. Perform tests, interpret and evaluate the validity of results, recognize unusual results and perform or recommend follow-up testing when indicated.
6. Practice laboratory procedures, including communication of test results to physicians and others, as needed.
7. Be aware of external regulatory requirements for quality laboratory operations, and apply them as assigned.
8. Correlate results from laboratory sections, and relate them to the clinical condition of the patient.
9. Practice professional behaviors, including maintaining confidentiality of patient data, neatness in work habits, performing to the best of your abilities, following established program policies, and assuming responsibility for your own performance in this course.

VI. Instructional methods: laboratory practice, daily quizzes, occasional exams.

VII. FAQs:

1. **How do I prove that I know what I'm doing?**

   In each section you get a quiz first thing every day. These are open book, with a 15-minute time limit.

2. **May I come at 10 after the hour and answer my quiz in 5 minutes?**

   No. We expect you to be here at the beginning, ready to go. As your simulated employers, we expect people to arrive as scheduled. There may be a time clock involved, so we can document your attendance.

3. **What do I do when I finish my quiz?**

   Shift from "student" mode to "tech" mode. Keep quiet. Start your work if it is quiet, such as organizing specimens and printing work sheets. Refrain from turning on noisy equipment until everyone is done. If you're in micro, don't open anaerobe jars while people are trying to think.

4. **How do I prove that I can do tests?**

   The instructor in charge of each department will explain this in detail:

Blood Bank	Ross	Management	Ross
Chemistry	Ross	Microbiology	deRegnier
Coagulation	Cook	Serology	deRegnier
Hematology	Cook	Urinalysis	Cook

   Evaluation will be different from what you're used to. As a student, you got more or less timely feedback on every lymph/mono or 1+/2+ decision. Now you will rely much more on quality control and on your own professional judgment. We will be here **sometimes** for consultation. You may need to save up questions for when someone is available to answer them. We will NOT answer questions when we are looking for you to make your own decisions. Examples of questions we don't want to answer:

   - "I ran the Axysym, and all three controls are three standard deviations out. Should I report results?"
   - "This patient is B positive. We only have two units of B positive, and I need four. What do I do?"
   - "What is this white colony on this plate?"
   - "Are these RBCs or WBCs in this urine microscopic? How many per field would you say?"

   This doesn't mean that we will never answer questions, or that we expect you to build the cell counter from scratch without guidance. But you're not really learning new techniques here- you're practicing things you've learned. Making decisions and solving problems are part of the job. Do it.

   We will be looking at your results, but not immediately. Many specimens have known results that we can compare. But just as your supervisors on the job or on internship will not know every result beforehand, neither will we. It's time for you to have confidence in your skills and judgment.

   We know you like feedback, especially compliments. Assume that, unless you hear otherwise, you're doing OK. We will be looking at your technique, results, record keeping, instrument maintenance, documentation, and problem solving approaches.

5. **How do I know what section of the lab I'm supposed to be in?**

   Look at the schedule. We'll post one in the lab, and you have a copy. It is YOUR responsibility to be sure you are assigned to each section, and to inform M. deRegnier if corrections are needed.

6. What if I'm sick?

This is where you MUST make the transition from student to tech. If you cannot be here when scheduled, you MUST telephone IN ADVANCE (231-591-2268). We expect to hear from YOU (not a friend) unless you are unconscious or dead. The voice mail system records the time of your call.

In real life, you get paid with money. Here you get academic credit. If you miss time, you have to make it up. See the appropriate instructor to make arrangements. Don't assume that we know your plans. Don't assume that the lab will be available when you want to come. Don't assume that specimens will be ready without any planning. Don't assume that if you don't make arrangements, we will forget.

7. What do I actually DO in this course?

This varies from one section to another. Plan on this general organization most days:

1400-1415	Quiz
1416-1500	Print work sheets Organize workload Perform and document instrument maintenance Find necessary specimens
1501-1730	Perform tests Take a 15 minute break
1731-1750	Clean up Complete documentation Store specimens Report results

8. Do I have to stay to the end every day?

Plan on it. Then you will be less disappointed when it happens. You may be finished, but someone else will need help. Again, this is like a job. The lab doesn't close if test volume is down. Everybody doesn't always get exactly the same amount of work.

9. May I omit my break and leave 15 minutes early, or come fifteen minutes late?

No.

10. May I bring my boom box or personal music player to lab?

No. If an instructor provides music, you have to listen to it. You may not want to listen, but you don't have any choice until you outrank him.

10. Do I have to follow the safety rules?

Yes, even the one about gum.

11. Where does the work come from?

It takes several hours to prepare the specimens. That's why this class meets in the afternoon. Many come from the local hospital. The faculty donates some. Some are controls. All are capable of transmitting disease. It's up to you to find the samples you need.

- We provide enough specimen. Just like a real lab, we will "redraw" when needed, but just like a real phlebotomist, we'll be crabby about it. If you put 2 mL of serum in a cup for an analyzer, and

it used 10 µL of that, don't throw the rest away until you know FOR SURE that no one else needs it.

- Some specimens may need to be shared between sections. Is serology without a serum? Try chemistry. In chemistry and need urine? Try urinalysis or microbiology. Wherever you are, hold any specimen that someone else might need. Give others a chance to figure out that they need it.
- On the other hand, if you know something belongs in another section, let them know that you have it. Don't keep a urine in micro until 1650 if it needs urinalysis. Don't do this even if you dislike the urinalysis tech.

12. Do I have to use the procedures in the procedure manuals? What if I know a better or easier way, or I'm more comfortable with methods I learned on the job?

Yes. You must, while working in this lab, use the methods of this lab. If you have suggestions, see the appropriate instructor.

13. What is a STAT?

A STAT test is ordered because the results are needed right away, in order to make patient care decisions. When a STAT test arrives, it should be begun immediately. Results should be reported as soon as they are available. Telephone results to the designated number or hand them to an instructor. Don't forget that a STAT test may need to be entered into the computer, so that you can report results when you are finished.

14. How will my delightful professional attitude be evaluated?

We will use the CLS Student Evaluation Form, probably in October. This is NOT a part of your grade.

15. What is all the paperwork for, and where is this LIS I keep hearing about?

Whether records are kept on paper or by computer doesn't matter: you have to document all testing correctly, including controls and calibrators. You will be working with:

- **Worksheets.** These will tell you what to do on each patient. They will get blood and stuff on them, but they either stay in the lab or can be discarded when you finish.
- **Maintenance records.** this is where you document that your instruments work, and that you take care of them.
- **QC records.** YOU STILL HAVE TO DO IT, AND YOU STILL HAVE TO RECORD IT SOMEWHERE (CHECK BY SECTION). IF YOU DO IT X3, YOU NEED TO RECORD IT X3.
- **Miscellaneous.** This varies with each section. Learn about it when you get there.

BE FLEXIBLE! The LIS is still new to all of us. We'll all be learning all semester.

17. What do I do with completed forms?

Each section has places to put things. Learn this. DON'T leave things out on tabletops. There are other courses in each lab this term. We get really irritated if we have to clean up after you before we can start our 8 AM or 9 AM lab. We can figure out whom to yell at if we need to.

18. What if I can't get my work done?

Ask for help from the lab manager or your section supervisor. He/she will try to find help for you. Keep working. Getting upset or quitting won't solve the problem. Nobody will want to help you if you're whining or screaming, either. Some days, we will give you too much to do, to see how you handle it. If you have to store tests overnight, IMMEDIATELY think two things:

- The specimen must be saved, and properly stored. It won't store itself. If you're not sure where to store it, the information SHOULD be in the procedure (but it might not be). ASK.
- You won't know what to do with the specimen tomorrow unless you have a test order. If nothing will be done on Joe Blow today, just keep the order that you have. If some tests are done, report them.

19. Why won't the faculty answer the @#$%^&* phone?

We don't need the practice. When you're near the phone and it rings, pick it up. Say, "Clinical Laboratory Sciences, this is _____." When you are called to the telephone, say "Blood Bank (or whatever), this is _____." Lab phones ring ALL THE TIME. Don't be intimidated.

20. What are external QC surveys?

To have a lab license and comply with CLIA regulations, every lab participates in an external QC program. Every couple of weeks, a box of samples will appear. The lab manager distributes them to the sections, and tells you the deadline for returning the results. Your results are compared with other labs (and with the right answers!) How you do will be discussed at lab meetings. Your section can be shut down if you do too badly, but don't get any ideas: by the time it gets shut down, you will be in a different section, so YOU won't get any time off. Besides, you might have to do remedial training. You don't want that.

21. Why do we have to have lab meetings?

We need to talk things over once a week or so. This course is a cooperative effort. Here's where we cooperate. We discuss whatever needs to be discussed, and have a match of the Who Wants to Be a MT.

22. What is Who Wants to Be a MT?

Yet another chance to review what you know. You will compete for prizes and glory. All you need to do is show up (bring your brain). Each week we also need a timekeeper, a scorekeeper, and someone to turn the room lights off and on.

The rules: Each round will consist of ten multiple-choice questions. Recall questions are worth $100. Interpretation questions are worth $500. Problem solving questions are worth $1000. The team with the highest bank account at the end of the tournament will get the best prize.

The audience can use notes, books, etc. The contestant has to use her brain. When a question is posted, you have one minute to either answer the question OR poll the audience (maximum once per question level per week). If poll the audience, two minutes per question will be allotted to come up with the answer.

The schedule:

Date	Hot Seat	Date	Hot Seat
Week 1	Team 1	Week 6	Team 3
Week 2	Team 2	Week 7	Team 1
Week 3	Team 3	Week 4	Team 2
Week 4	Team 1	Week 9	Team 3
Week 5	Team 2	Week 10	Awards

The teams:

Team 1	Team 2	Team 3
Niki	Kerri	Dee
Chuck	Bob	Eric
Jane Ann	Christina	Amanda
Susan		

VIII. Resources, references, and supplies

Books: There are some reference books in each lab. They come in handy for quizzes. Use them when you need to, but DON'T take them out of the lab.

Computers: There are computers if you need a web site.

Supplies and reagents: Get them. Find them. Make them. This is part of the job. If you check before you start, you won't need to panic part way through a procedure. If you **almost** empty something, write a note for Sandy. Don't put 1 drop of chemistry calibrator back in the refrigerator, for example. It won't be enough for whoever needs it the next day. Use your head- don't ask for micro media and expect to get it 15 minutes later. The media chefs need at least 24 hours to make things. They aren't trying to make your life difficult. This is how the world works. Again, we can figure out who is causing any of these problems.

Supplies you need to bring: your lab coat, a marker, and your nametag. You may be issued a magnetized card to clock in and out.

IX. Grading and Evaluation:

Lab Skills	50%
Knowledge	20%
Exams (4 at 5% each)	20%
Comprehensive exam	10%
	100%

Lab skill and quiz grades are further divided according to the amount of time spent in each laboratory department:

	Psychomotor	Cognitive
Blood Bank	6/30 x 0.5 = 10%	6/30 x 0.2 = 4%
Chemistry	7/30 x 0.5 = 11.67%	7/30 x 0.2 = 4.67%
Hematology et al	6/30 x 0.5 = 10%	6/30 x 0.2 = 4%
Management	4/30 x 0.5 = 6.67%	4/30 x 0.2 = 2.67%
Microbiology et al	7/30 x 0.5 = 11.67%	7/30 x 0.2 = 4.67%
Total	30/30 x 0.5 = 50.00%	30/30 x 0.2 = 20.00%

Exams

The Big Exam: Early in CLLS 499, everyone gets a big exam covering clinical laboratory science (about 125 questions). **Your score on this exam will be 10% of your course grade for CLLS 456.** Students who score 60% or better on this exam will be excused from repeating it on the date scheduled for the CLLS 456 final. Students who score less than 60% **must** retake the exam on the date scheduled for the CLLS 456 final exam. We consider a score of 60% to be an indication that you know enough to benefit from clinical experience.

The subject exams: Four subject exams are given during this course, covering the major areas of work. There are 50-60 questions per exam. The number of questions covering each subject is averages of the numbers of questions used by certification agencies over the past several years.

Each of these exams will be 5% of your grade. Your grade will be compared to the grades from everyone else who has taken the exam. If your score is equal to the mean score of previous students, you get 4%. If your score is equal to the mean plus one standard deviation, you get 5%. If your score is equal to the mean minus one standard deviation, you get 3%. If your score is equal to the mean minus two standard deviations, you get 2%. If your score is worse than that, you get 1%.

There is a reason for this odd system: these exams are hard. We could use percent scores, but that would be too harsh a grade. (Most scores are in the range of 25-35 questions correct). The exams cover all aspects of the laboratory disciplines- you may not be doing virology or endocrinology testing, or issuing blood components here, but that doesn't mean that you don't need to review that material. Consult the appropriate instructor for the exact date of each of your exams.

There is a special event nearly every day in sim lab:

Day	Date	Event	Manager	Supervisors
Day 0	09/9	Introduction – B.H.E. for all		
Day 1	09/14	First day of work! Everybody starts somewhere		
Day 4	09/16	Lab meeting; WWTBAMT? Team 1 in the hot seat		
Day 5	09/21	External QC #1 distributed		
Day 7	09/23	Lab meeting; WWTBAMT? Team 2 in the hot seat		
Day 9	09/29	External QC survey #1 due	Jane Ann	Niki (B), Amanda (C)
Day 10	09/30	Lab meeting; External QC #1 evaluated. WWTBAMT? Team 3 in the hot seat		
Day 11	10/5	External QC #2 distributed	Amanda	
Day 13	10/7	Lab meeting; WWTBAMT? Team 1 in the hot seat	Chuck	
Day 15	10/13	External QC survey #2 due	Susan	Christina (H)
Day 16	10/14	Lab meeting; External QC survey #2 evaluated WWTBAMT? Team 2 in the hot seat	Susan	Christina (H)
Day 17	10/19	External QC survey #3 distributed	Christina	Jane Ann (M), Chuck (C)
Day 19	10/21	Lab meeting; WWTBAMT? Team 3 in the hot seat		
Day 21	10/27	External QC survey #3 due		
Day 22	10/28	Lab meeting; External QC survey #3 evaluated WWTBAMT? Team 1 in the hot seat		Eric (B)
Day 23	11/2	External QC survey #4 distributed	Niki	Eric (B), Susan (M)
Day 25	11/4	Lab meeting; WWTBAMT? Team 2 in the hot seat		
Day 27	11/10	External QC survey #4 due		
Day 28	11/11	Lab meeting; External QC survey #4 evaluated WWTBAMT? Team 3 in the hot seat	Kerri	
Day 31	11/18	Hooray! We've all lived through this! Awards Ceremony	Eric	Kerri (B), Bob (H)

CLLS 459: IMMUNOHEMATOLOGY 2
Winter, 2004

I. Course Information

A. **Meeting time:** 1330 - 1620T
B. **Location:** VFS 421
C. **Credit hours:** 1
D. **Course configuration:** 0 + 3

E. **Course Description:** Application of theory from immunology and immunohematology to problems in blood banking, including ABO and Rh typing anomalies, antibody identification, and positive direct antiglobulin tests.

F. **Prerequisites:** CLLS 228 and 251 or equivalents, or permission of instructor

II. Instructor: Barbara Ross, MT(ASCP)

A. Office: VFS 303
B. Office phone: 231.591.2317
C. E-mail: ROSSB@FERRIS.EDU
D. Office hours: 1300 – 1350R; 1400 – 1450 MWR; others by appointment

III. Required books:

A. Harmening, Denise M. Modern Blood Banking and Transfusion Practices, fourth edition. FA Davis, 1999.
B. Ross, Barbara. CLLS 459 Laboratory Manual. Available at Barnes and Noble in the Rankin Center.

Why Harmening? Well, because you already have it! Harmening is a well-organized and well-recognized author, who has gathered a number of experts to put this book together. It is up-to-date, well written, and even interesting.

Why the course manual? It has all the lab procedures you'll need. Bring it whenever the word LAB appears on the schedule.

IV. Course objectives: See the end of this syllabus.
V. Course goals: In keeping with the CLS program goals listed in the CLS Student Handbook, goals for this course are to provide you, the student, with opportunities to:

A. Practice laboratory safety, applying your knowledge of blood borne pathogens and chemical hygiene.
B. Develop technical competence.
C. Integrate theory and practice, especially in solving problems beyond daily blood banking practice.
D. Evaluate the suitability of samples for testing.
E. Perform tests, evaluate results, recognize unusual results and perform or recommend follow-up testing when indicated.
F. Apply quality assurance practices to the blood bank laboratory.
G. Practice professional behaviors, including maintaining the confidentiality of patient data, neatness in work habits, performing to the best of your abilities, following established program policies, and assuming responsibility for your own learning.

VI. Instructional methods: Question and answer, discussion, laboratory practice, case studies.

VII. **Course Requirements:**

A. Question and answer: Please read about the topics beforehand, and be prepared for class.
B. Labs: If the schedule says LAB, bring your lab coat and Sharpie marker and your lab manual. Remember that I expect you to record results and conclusions IN INK. I'm picky about documentation.
C. Case studies: Most weeks, there will be a case study to discuss as a group in class.
D. Exams: The first exam isn't part of your grade. It's just to get your brain focused on blood bank again. The other exams will count. They're cumulative, including last semester. Be prepared. They'll be multiple choice and some case study/problem solving questions.
E. Presentation: You will research a blood – bank related topic, and present it to the class. A list of references you will use and an outline will be due beforehand.

VII. Resources, references, supplies:

A. **Another book:** If you can borrow a copy, the Technical Manual of the American Association of Blood Banks is a great resource. It would be the text for this course if it didn't cost $100. I'll put a couple of copies in VFS 104. Please don't remove them from the lab.
B. **Web resources:**

http://rex.nci/nih.gov/behindthenews. A terrific site with an easy tutorial about immunology. If you need a review with great illustrations, this is the site for you.

Http://www.biology/arizona.edu/humna_bioproblem_sets/blood_types/intro.html. A wonderful tutorial about ABO types and how you inherit them. There's also a tutorial about ELISA testing, if you need to review that.

http://www.ualberta.ca/~medlabsc. The site of the University of Alberta's lab science program. Look for Pat Letendre's home page with content from her blood banking courses.

http://www.aabb.org. The site of the American Association of Blood Banks. It has sections about donating and receiving blood, written for the general public. There are also links to other professional societies, and government agencies such as the FDA and CDC.

http://www.Pall.com. Pall makes all kinds of filters, including leukocyte reduction filters for blood components. They have an online newsletter, as well as ongoing discussion about whether all components should have leukocytes reduced. (Remember, they sell the filters, so this isn't an unbiased site).

http://www.vh.org. The Virtual Hospital site at the University of Iowa. Search on blood bank and see what you can find.

http://pathweb.pds.med.umich.edu/handbook/index.html. The University of Michigan's policies and procedures about blood transfusion.

Let me know if you find other useful sites!

C. Supplies: You'll need a lab coat, nametag, and black indelible marker.

VIII. Grading and evaluation:

		Points	%
Exams	2 @ 100	200	40
Case studies	10 @ 10	100	20
Labs	7 @ 10	70	14
Presentation	1 @ 30	30	6
Final	1 @ 100	100	20
Total		500	100

The standard grading scale of the CLS programs will be used.

Level of comprehension expected: I expect you to apply your knowledge of routine blood banking to the problems you encounter this semester. The problems are the kind of non-routine situations that occur in any blood bank or transfusion service. You'll need to think clearly, and act wisely. You can do this!

Don't give up if you're confused. See me for help, of send e-mail, or ask for more practice problems. I want everyone to succeed. I may need your blood banking services some day, and I want you to be ready!

IX. Attendance requirements

I take attendance in this course. This is your last chance before internship to review what you already know about blood banking and learn some new problem solving techniques. You need to move beyond the day-to-day routine to practice some MT skills, including quality assurance and inventory management. YOU NEED TO BE HERE.

If you must be absent, telephone IN ADVANCE to 231.591.2317 and leave a message. If you don't I'll conclude that you're absent due to lack of interest, and you don't get to make up the work you missed.

Acceptable reasons for missing class include illness, weather emergency, death in the family, required court appearances, and trips made by you as a varsity athlete. If you have some other situation, please discuss it with me in private.

X. Additional information:

If you have a disability that would make it difficult to complete the objectives for this course, see Mrs. Ross STAT. We'll do what we can to help.

XI. Tentative schedule:

Date	Topic
0113	**Organization:** self-assessment. **Due:** Choose a presentation topic **Assignments:** ABO/Rh Typing Problems
0120	**Lecture:** ABO/Rh Typing Problems **Discuss:** Case Study #1 **Assignments:** HLA and Parentage
0127	**Lecture:** HLA and parentage questions **Discuss:** Case study #2 **Assignments:** Antibody Identification
0203	**Lecture:** Some antibody identification questions **LAB:** Antibody identification using selected cells **Discuss:** Case study #3
0210	**Lecture:** Some antibody identification questions **LAB:** Antibody Identification Using Proteolytic Enzymes (one – stage) **Discuss:** Case study #4
0217	**Lecture:** Some antibody identification questions **LAB:** Antibody Identification Using Proteolytic Enzymes (two – stage) **Discuss:** Case study #5
0224	**Lecture:** Some antibody identification questions **LAB:** Neutralization of antibody **Discuss:** Case study #6; **Due:** Reference list for presentation **Assign:** Positive DAT questions
0302	**Exam #1**
0309	**Spring Break: no class**
0316	**Lecture:** Some positive DAT questions (cold AIHA) **LAB:** Elution of antibody (heat) **Discuss:** Case study #7
0323	**Lecture:** Some positive DAT questions (warm AIHA) **LAB:** Elution of antibody **Discuss:** Case study #8
0330	**Lecture:** Positive DAT questions (drug – induced) **LAB:** Using chloroquine phosphate to remove antibody **Discuss:** Case study #9 **Due:** Outline of presentation **Assign:** Alternative techniques questions
0406	**Lecture:** Alternative techniques **Discuss:** Case study #10 **Assign:** Inventory Maintenance questions
0413	**Lecture:** Inventory Maintenance **Organize:** Choose sequence for presentations
0420	**Exam #2**
0427	**Presentations**
0504	**Probable date of final exam (more info when available)**

CLLS 465: General and Technical Supervision in Clinical Laboratory Science
Fall, 2004

I. General Course Information

A. **Meeting times and location:** 1200 – 1315 TR; VFS 423
B. **Credit hours:** 3
C. **Course configuration:** 3 + 0
D. **Course Description:** Application of statistical analysis to the evaluation and quality improvement of clinical laboratory procedures, instruments, and operations. Application of management theory and techniques to clinical laboratory operations. Meeting regulatory, accreditation, and compliance requirements.
E. **Prerequisites:** EHSM 315, CLLS 355, CLLS 430, CLLS 435, or equivalents.

II. Faculty and how to contact me:

Name	Barbara Ross
Credentials	MS, MT(ASCP)
Office	VFS 303
Phone	231.591.2317
E-mail	**ROSSB@FERRIS.EDU**
Office Hours	TR 0900 – 1050; and by appointment

If I'm not available during office hours, I'll post alternatives. If you can't come during my office hours, let me know and we'll figure something out.

III. Required textbooks: none

IV. Course goals and objectives:

A. **Goals:** The main goal of this course is to get you thinking like a PROFESSIONAL medical technologist, who looks at the big picture of how laboratory services fit into health care. Because management can be so amorphous, we'll try to be as specific as possible. Goals are to provide you with opportunities to:

1. Assess safety practices and suggest improvements for an assigned laboratory.
2. Practice writing documents in common laboratory use.
3. Perform an audit of laboratory practices, making recommendations to bring the laboratory into compliance with regulations.
4. Assess the competence of practicing personnel, and plan for remediation, as needed.
5. Measure laboratory productivity, and study ways to improve.
6. Practice budgeting and cost measurement.

A. **Objectives:** Course objectives are listed at the end of this syllabus.

Instructional methods: Written assignments, in – class assignments, group projects.

VI. Course Requirements:

A. **Written assignments:** All written assignments must be prepared on a word processor. Be sure to use Spell-Check and standard formatting.
B. **In-class assignments:** Some short assignments will be completed during class, though not necessarily in VFS 425. You may move to the computer lab, or the CLS labs.

VII. Resources, references, supplies

A. **Web resources: Here are three. Please let me know if you find others that future students would find useful.**

1. www.CAP.org. This is the site of the College of American Pathologists. You'll use it to get accreditation checklists for your laboratory section.
2. www.CLMA.org. This is the site of the Clinical Laboratory Management Association, which is a really valuable source about politics, regulations, and what's going on in general.
3. www.medialabinc.net. This is the source of the exposure control plans you'll use, and they also sell competency assessment materials, if you're rich enough to BUY assignments, rather than home-growing them.

B. **Supplies that you need for this course:** You'll need at least one floppy disk, so I can give you templates and other materials to complete assignments.

VIII. Grading and Evaluation

A. **What work will be graded?**

Assignment	Points	Percentage
Attendance and participation	30	7.50%
Cognitive domain objectives	15	3.75%
Psychomotor domain objectives	15	3.75%
Affective domain objectives	15	3.75%
Cognitive evaluation	20	5.00%
Psychomotor evaluation	20	5.00%
CAP accreditation check sheet and recommendations	50	12.50%
Exposure control plan	50	12.50%
SOP	40	10.00%
Productivity assignment	10	2.50%
Schedule assignment	10	2.50%
Budget/timeline	10	2.50%
Cost per test assignment	20	5.00%
Coding assignment	10	2.50%
HIPAA assignment	10	2.50%
Competency assessment: topics	10	2.50%
Competency assessment: knowledge assessment	10	2.50%
Competency assessment: skills assessment	10	2.50%
Competency assessment: implementation	20	5.00%
Competency assessment: remediation/recommendations	25	6.25%
Total	400	100%

B. **Level of comprehension expected:** Nobody knows everything about management. Most of you won't become lab managers right after you graduate. But EACH OF YOU will need to practice these skills, and probably sooner than you think. So I want you to be comfortable with thinking of yourself as a competent individual.

IX. Attendance

A. **College Attendance Policy:** The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. **Mrs. Ross's Attendance Policy:**

1. **I will take attendance in this course.** You're learning techniques to use on the job. Therefore, I expect you to attend every class. Think of this as your job. If you must be absent, as with a job, telephone IN ADVANCE (231-591-2317) and leave a message. If you don't, I will assume that you are absent due to lack of interest, and are also not interested in making up the assignment. It is time to be serious about your work.
2. **Acceptable excuses include:** illness, weather emergency, death in the family, required court appearances, and trips made by you as a varsity athlete.
3. **If you miss class with an excuse reported ahead of time:** See me. We'll figure out a way for you to learn the content that you missed. You lose half a point.
5. **How else can you lose half a point?** Come to class late. My definition of late: if it's 1200 by the room clock and you're not in the room, and I don't see you in the hall, you're late.
6. **If you miss class on a day when we do an in-class exercise:** You lose the points for the assignment. I don't have time to do one-on-one tutoring fall semester. I make exceptions for EXTRAORDINARY events. I've done this once in 20+ years, so don't think a doctor's appointment is extraordinary.
7. **If you miss class without an excuse:** You're on your own for the material, and any assignments that were given out. I intend to make this course SO MUCH FUN that you won't be able to WAIT to get here and get going.

C. Mrs. Ross's Tardiness Policy:

Class begins at 1200. I expect to see you present and ready to go. If you're not, expect to lose points for any assignment that you began late.

X. Guidelines for Student Conduct

A. Come on time and be ready to start.
B. Bring your calculator EVERY TIME. Forgetting it doesn't mean you don't have to calculate, it means YOU HAVE TO CALCULATE WITHOUT IT.
C. Cooperate.
D. Have fun, and learn all you can.

XI. Other General Course Policies

A. ADA: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

B. Harassment: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

C. Religious Holidays: refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm for a copy of this policy.

D. Disruptive Student Policy: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

CLLS 465: General and Technical Supervision in Clinical Laboratory Science
Fall, 2004 Tentative Schedule

Date	Topic	In – Class Task	Assignment DUE TODAY
T 0931	Introduction, organization	Team building; Choose a lab section to work on	**Mission and goals for team**
	Section I: Laboratory Education		
R 0902	Introduction to Instructional Objectives; Writing cognitive domain objectives	Draft cognitive objectives ; evaluate objectives	
T 0907	Writing psychomotor domain objectives	Draft psychomotor objectives; evaluate objectives	
R 0909	Writing affective domain objectives	Draft affective objectives ; evaluate objectives	**Cognitive domain objectives**
T 0914	Psychomotor evaluation	Draft psychomotor evaluation items; evaluate psychomotor system	**Psychomotor domain objectives**
R 0916	Cognitive evaluation	Draft cognitive evaluation	**Affective domain objectives**
T 0921	Cognitive evaluation	Evaluate cognitive evaluation	**Psychomotor domain evaluation**
	Section II: Quality Issues		
R 0923	Laboratory accreditation: CAP checklist	Get CAP checklist and get started	
T 0928	Work on accreditation checklist	Progress meeting with instructor at assigned time TBD	**Cognitive domain evaluation**
R 0930	Report on CAP accreditation requirements	Top 10 things to fix before inspection	**CAP accreditation report and recommendations**
T 1005	Safety: Exposure control plan	Get exposure control plan and get started	
R 1007	Work on exposure control plan	Progress meeting with instructor at assigned time TBD	
T 1012	Standardization: the SOP	Get SOP assignment	**Exposure control plan**
R 1014	HIPAA and the lab	HIPAA activity	**HIPAA Activity**
	Section III: Productivity and Finance		
T 1019	Laboratory Productivity/benchmarks	Benchmark activity	**Benchmark activity; SOP**
R 1021	Productivity	Productivity activity	**Productivity activity**
T 1026	Scheduling personnel	Scheduling assignment	
R 1028	Finance/budgeting	Budget/ timeline	**Budget/ timeline**
T 1102	Cost/test		**Scheduling assignment**
R 1104	Coding and reimbursement	Coding activity	**Coding activity**

CLLS 465: General and Technical Supervision in Clinical Laboratory Science
Fall, 2004 Tentative Schedule, continued

Date	Topic	Task	Assignment
	Section IV: Competency Assessment		
T 1109	Introduction to competency assessment	Choose topics for assessment	**Cost / test; Competency assessment plan**
R 1111	Knowledge assessment	Draft knowledge assessment	**Knowledge assessment instrument and plan**
T 1116	Skills assessment	Draft skills assessment	**Skills assessment instrument and plan**
R 1118	Competency assessment	Assess 1 area	
T 1123	Competency assessment	Assess 1 area	
R 1125	**Thanksgiving**	**No class**	**Overeat**
T 1130	Competency assessment	Assess 1 area	
R 1202	Competency assessment	Assess 1 area	
T 1207	Evaluating assessments; design remediation	Grade assessments; assign pass/fail; develop remediation plan	
R 1209	Evaluate process	Present recommendations for remediation	**Remediation plan**

CLLS 465: General and Technical Supervision in Clinical Laboratory Science
Course Objectives

Upon completion of this course, the student will be able to (as assigned):

Section I: Quality Assurance and Benchmarking

A. Define the following terms:

1. Accuracy
2. Analytical error
3. Benchmarking
4. Continuous quality improvement
5. Post analytical error
6. Post-analytical error
7. Pre analytical error
8. Quality assurance
9. Quality control
10. Root cause analysis

B. Gain institutional support for quality assurance of laboratory testing, as assigned.

C. Work with a team to establish a mission and goals for a laboratory section.

D. As assigned for a laboratory problem, design a benchmarking process to:

1. Establish indicators
2. Gather data
3. Determine root causes
4. Propose and implement improvements
5. Monitor improvements over time

E. Discuss the role of laboratory accreditation in quality laboratory operations.
F. Complete a pre-accreditation checklist for a laboratory section, identify deficiencies, and prepare a plan for improvement of operations, as assigned.
G. As assigned, write a laboratory SOP, using the NCCLS format.
H. Discuss the impact of HIPAA regulations on laboratory practice, as assigned.

II. Laboratory Safety

A. Examine laboratory operations for safety hazards, as assigned.
B. As assigned, use a template to prepare an exposure control plan for one of the following:

1. Blood-borne pathogens
2. Chemicals
3. Formalin
4. Tuberculosis

C. Recommend changes in laboratory operations to improve safety or remove hazards, as indicated.

III. Finance and Productivity

A. Relate issues of coding, reimbursement, and compliance to daily laboratory operations.
B. As assigned, calculate the cost to perform a laboratory analysis.
C. As assigned, prepare a laboratory budget.
D. Gather and use laboratory data to estimate laboratory productivity.
E. Compare the productivity of the simulated laboratory to national benchmarks.
F. As assigned, recommend changes to increase productivity in the simulated laboratory.
G. Perform simple exercises related to coding and compliance for laboratory testing.

III. Finance and Productivity, continued:

H. Define the following terms relating to finance and productivity:

1. Annual profit/loss
2. Billable test
3. Break-even volume
4. Consumable
5. Cost/test
6. Direct cost
7. Direct labor
8. Direct material
9. Fixed cost
10. Indirect labor
11. Indirect material
12. Inpatient test
13. Margin
14. Margin %
15. Non-billable test
16. Non-patient test
17. Non-technical employee
18. Overhead
19. Paid hour
20. Profit
21. Profit margin
22. Ratio: billable/non-billable tests
23. Reportable tests
24. Revenue/test
25. Technical employee
26. Test cost
27. Test price
28. Total revenue
29. Variable cost
30. Work station
31. Worked hour

IV. Personnel issues

A. As assigned, complete time management exercises.
B. Discuss the process of guiding laboratory staff through major changes.
C. Schedule a group of laboratory employees, following established guidelines.
D. Prepare recruitment materials for laboratory personnel.
E. Design, prepare, implement and evaluate the competency of laboratory employees, including, as assigned:

1. Plan tasks and topics for a given laboratory section
2. Write objectives for the cognitive, affective, and psychomotor domains
3. Write items for cognitive evaluation, including, as applicable and appropriate:

    a. Case studies
    b. Computerized exams
    c. Essay questions
    d. Matching
    e. multiple choice
    f. oral exams
    g. short answer questions
    h. true-false questions

4. Choose methods for evaluation of psychomotor competency, including, as applicable and appropriate:

    a. Direct observation
    b. Practical assignments
    c. Unknown/blind sample analysis

5. Prepare a lesson plan, for a unit of instruction for laboratory students or new employees
6. Prepare materials needed for the competency evaluation, including scheduling, as appropriate
7. Administering the competency evaluation to fellow students.
8. Evaluating performance.
9. Designing remediation, as needed.
10. Writing a report with recommendations for future competency evaluations.

Syllabus

Course Information

Course title:	Clinical Labatory Practice
Course number:	CLLS 491
Course description:	Application of theories and techniques in immunohematology, clinical immunology, clinical chemistry, clinical microbiology, hematology, coagulation, and body fluid analysis with an emphasis on correlation of test results and problem solving skills in a clinical laboratory setting for 18 weeks
Course date:	Monday, January 13, 2003 through Friday, May 23, 2003
Location:	Various Clinical Affiliates
Meeting day(s):	Monday - Friday
Meeting time(s):	Varies
Prerequisite(s):	CLLS 456

Instructor Information

Name:	Barbara Ross
Email:	rossb@ferris.edu
Office location:	VFS303
Office hours:	MW 0900 - 1050
Phone:	231.591.2317
Biography:	A real great gal!

Course Objectives

Course goals: Refer to http://webct.ferris.edu/SCRIPT/CLLS491_DD/scripts/serve_home.

Course Goals

Course goals: Course goals: In keeping with the CLS program goals listed in the CLS Student Handbook, goals for this course are to provide you, the student with opportunities to:

A. Practice laboratory safety, applying your knowledge of blood borne pathogens, chemical hygiene, and laboratory safety policies.

B. Develop technical competence through guided practice in a laboratory setting.

C. Integrate theory and practice.

D. Evaluate the suitability of samples submitted for testing.

E. Perform tests, evaluate results, recognize unusual results and perform or recommend follow - up testing when indicated.

F. Apply quality assurance practices to the clinical laboratory.

G. Practice professional behaviors, including maintaining the confidentiality of patient results, neatness in work habits, performing to the best of your abilities, following established program and laboratory policies, and assuming responsibility for your own learning.

H. Incorporate your clinical laboratory science, general education and other courses into daily practice in the clinical laboratory.

I. Be evaluated fairly based on your skills, knowledge, and performance.

J. Work as a member of a health care team, focusing on patient care.

K. Practice maintaining professional competence under the normally stressful conditions of the laboratory.

L. Be aware of the impact of external regulatory requirements, such as those of CLIA 88, OSHA, HIPAA, and NAACLS, and to comply with those requirements.

- List and describe the five basic subgroups of myelodysplastic disorders. Include the peripheral blood and bone marrow picture seen in each and explain how each of the subgroups differ.
- Describe the treatment and prognosis for patients with myelodysplastic syndrome.
- Explain the relationship between myelodysplastic syndromes and acute leukemia.

- Acute Myelogenous Leukemias
  - List and describe the different classifications of AML based on their FAB classifications. Include the peripheral blood and bone marrow picture seen in each.
  - Describe the population generally affected, clinical symptoms, and prognosis usually seen in patients with AML.
  - Explain how different cytochemical stains may be used to help classify different AMLs. List the expected reactions seen in the various chemical stains.
    - Define the following: Auer Rod, Phi Body, WHO Classification, FAB Classification.
  - Explain the difference between the FAB & WHO classification systems.

- Acute Lymphoblastic Leukemias
  - List and describe the three classifications of ALL using the FAB system. Include the peripheral blood and bone marrow picture seen in each.
  - Explain the use of immunological phenotyping to differentiate ALLs.
  - Describe the population generally affected, clinical symptoms, and prognosis usually seen in patients with ALL.
  - Describe the reaction of various cytochemical stains used to help diagnose ALL.

- Lymphoid Malignancies
  - Describe the following lymphoid malignancies based on their clinical presentation, hematological picture, and general lab picture: chronic lymphocytic leukemia, lymphoma, multiple myeloma, prolymphocytic leukemia, hairy cell leukemia.
  - Describe the differences between Hodgkin and non-Hodgkin lymphoma.
  - Define the following terms: Reed-Sternberg cell, rouleaux, Sezary cell, smudge cell, Burkitt lymphoma, Waldenstrom's macroglobulinemia.

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CLLS ~~236~~ Diagnostic Microbiology

Credits: 4

Course Configuration: 2 + 6

Instructor	Office	Phone	Office Hours
Daniel P. deRegnier, MS, MT (ASCP) deregnid@ferris.edu	VFS 408	591-2327	M: 14:00-16:00 T-R: 09:00-10:00

Course Description:

Theoretical and laboratory aspects of diagnostic microbiology with an emphasis on correlation of test results and basic problem-solving techniques used in the identification of clinically significant bacteria. We will begin with a brief review of microbiology and discuss the bacteria that have clinical importance for humans. The lab begins with some basic skills that are essential for clinical microbiology and then we will concentrate on identification of clinically significant bacteria.

Prerequisites:

BIOL 108 or BIOL 286, BIOL 205, CHEM 214, or equivalents and admission to the Clinical Laboratory Science program.

Electronic mail address. I will communicate with you using your Ferris IMAIL account only. You should check this everyday.

Lecture Schedule:		**Lab Schedule**	
M, F: 12:00 – 12:50	Room 325	Sect. 211: 10:00-11:50 TWR Sect. 212: 12:00 – 13:50 TWR	Room 421

Textbook:

Required

Textbook of Diagnostic Microbiology, 2000, Mahon, Connie and George Manuselis, *2nd Ed, Saunders.* We will use this book for CLLS 235 CLLS 240, and CLLS 435.

Lab Manual. You will have to buy this. It should be in the Lundberg Bookstore.

Supplemental

There are textbooks available for student use. They are located in Room 421. Do not remove them from the lab without checking with me first. You may also want to check out c. This is "Medical Microbiology" edited by Samuel Baron. It is a complete textbook on line.

Evaluations:

I will be trying something new this year. Using WebCT, I will post a quiz after each major topic area (e.g. Gram positive cocci, Gram positive bacilli, *Neisseria*, Haemophilus, Enterobacteriaceae, Misc. negative bacilli, VAP, NFB, *Mycobacterium* and *Rickettsia/Spirochetes*). Twenty-five points of each quiz will be devoted to the major

topic area. Starting with quiz 2, I will include a question from the preceding topic area so I know you are reviewing the material. Quiz 3 will have 25 points devoted to Neisseria, 1 question on Gram positive cocci and 1 question about Gram positive bacilli, etc. ***Each quiz will be available for 3 days, beginning the day after we finish the topic. This includes weekends. You will be allowed 60 minutes to take the quiz and you will have one attempt only. NO EXCEPTIONS. IF YOU FORGET TO TAKE THE QUIZ YOU WILL NOT GET ANOTHER OPPORTUNITY! YOU WILL RECEIVE A ZERO FOR THAT QUIZ.***

There will be a comprehensive exam scheduled during finals week. It is 100 multiple choice questions.

In lab, we will have two written lab quizzes and two laboratory practical exams, with the second exam being **comprehensive**. In addition, eight unknowns contribute to the final lab grade. The lecture portion of the course is worth 50% of your grade, so I guess that means the lab will be worth 50% as well. Your grades are based on total points available. The total number of points will vary, so I can't give you a definite number. I use the standard CLS grading curve. Refer to your handbook for information regarding the grading scale. For example, if you have earned 275 of 325 total points your grade will be B (84.6%)

I do not post grades publicly. I will post grades to the CLLS235 WebCT course. Please check it often to monitor your progress.

Attendance Policy:

This is an interesting and challenging course. Please make every effort to attend all class meetings. You will be responsible for all material handed out in lab and lecture. If you have to miss a lecture for any reason, please let me know ahead of time. Twenty-four hours would be nice, but I know that is not always possible. Call my office (591-2327) and leave a message...I have voice mail. The same goes for missing a lab. If you skip a lab without a reasonable excuse that was cleared through me ahead of time, you will not have the opportunity to make up that lab. My fragile ego will also be wounded. Due dates for assignments and lab exercises are included when the assignment is made. There will be one point deducted for each day the assignment is late. I sometimes give hand outs at the beginning of lecture and lab. Once the class is over for the day, those handouts will no longer be available from me, so I suggest you come to class everyday. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

One more thing, HATS MAY NOT BE WORN DURING MICROBIOLOGY LABORATORY.

GENERAL POLICIES:

Student Dignity

The University expects all students and employees to conduct themselves with dignity and respect for students, employees, and others. It is each individual's responsibility to behave in a civil manner and make responsible choices about the manner in which they conduct themselves. Harassment of any kind is ***not acceptable*** at Ferris State University. The University does not condone or allow harassment of others whether engaged in by students, employees, supervisors, administrators, or by vendors or others doing business with the University.

Harassment is the creation of a hostile or intimidating environment in which verbal or physical conduct, because of its severity or persistence, is likely to significantly interfere with an individual's work or education, or adversely affect a person's living conditions.

To assist with the understanding of what harassment is, this policy contains specific definitions of two of the more prevalent types of harassment – racial harassment and sexual harassment.

Harassment

Racial harassment includes any conduct, physical or verbal, that victimizes or stigmatizes an individual on the basis of race, ethnicity, ancestry, or national origin. Such behavior could involve
verbal conduct, intentional or otherwise, that has the purpose or effect of (or explicitly or implicitly threatens to) interference with an individual's personal safety, academic efforts, employment, or participation in University-sponsored activities.

The attributes of racial harassment described above are also the attributes of most other types of harassment that can occur. Harassment may be based upon a person's status that is protected by law (i.e., religion, veteran status, handicap, etc.), or may be for some other reason not specifically covered by law. In any event, harassment of any type is ***not acceptable*** at Ferris State University.

Sexual Harassment

Using the definition contained in the Equal Employment Opportunity Commission guidelines, adapted to include educational environments, sexual harassment is defined as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) submission to such conduct is made either explicitly or implicitly term or condition of an individual's employment or academic advancement;
2) submission to or rejection of such conduct by an individual is used as a factor in employment or academic decisions affecting such individuals;
3) such conduct has the purpose or effect of substantially interfering with an individual's work or academic performance, or creating an intimidating, hostile, or offensive working, living, or academic environment.

While sexual harassment most often takes place in situations of power differential between the persons involved, sexual harassment may also occur between persons of the same status, e.g., student-to-student. The person exhibiting sexually harassing conduct need not realize or intend the conduct to be offensive for the conduct to constitute sexual harassment.

Harassment Concerns

Any person who believes he or she has been subjected to harassment of any kind (sexual, racial, or otherwise) should approach the individual whom they believe is responsible. He or she should identify the specific behavior, explain that he or she considers the behavior to be offensive and/or harassing, and ask the individual to stop the behavior. If assistance is needed to approach the individual, contact either an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, or the Director of Affirmative Action.

If approaching the individual is not possible (i.e., you are uncomfortable or uncertain as to how the situation should be handled or concerned the situation may become volatile) or does not resolve the matter, it should then be reported immediately to an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, the Director of Student Judicial Services, or the Director of Affirmative Action. If, for some reason, you are uncomfortable discussing your situation with any of these individuals, please report your situation to any member of University administration. The circumstances surrounding the matter will be fully investigated, including the nature of the harassment and the context in which it occurred.

All reports of harassment and subsequent investigations will be kept as confidential as possible. Anyone found to have violated this Policy will be subject to discipline up to and including discharge and dismissal that may include, but not be limited to, official reprimand, official apology, sensitivity training, and/or other disciplinary action including dismissal. Likewise, because intentionally false accusations of harassment can have serious effects on innocent people, anyone found to have intentionally falsely accused another person of violating this Policy will be subject to discipline up to and including discharge or dismissal.

Disruptive Behavior Policy Statement

The College of Allied Health Sciences strives to maintain a positive learning environment and educational opportunity for all students. Consequently, patterns of behavior which obstruct or disrupt the learning environment of the classroom or other educational facilities will be addressed.

1. The instructor is in charge of the course. This includes assignments, due dates, methods and standards of grading, and policies regarding attendance, tardiness, late assignments, outside conferences, etc.
2. The instructor is in charge of the classroom. This includes the times and extent to which they allow questions or discussion, the level of respect with which they and other students are to be treated, and the specific behaviors they will allow within their classes. Open discussion of an honest opinion about the subject of a course is encouraged, but the manner in which the class is conducted is a decision of the instructor.
3. If a student persists in a pattern of recurrent disruptive behavior, then the student may be subject to administrative action up to and including an involuntary withdrawal from the course,

following administrative review by the Allied Health Sciences Dean's Office, and/or University disciplinary proceedings.

4. Disruptive behavior cannot be sanctioned by a lowered course grade (e.g., from a B to a C) except insofar as quality of classroom participation has been incorporated into the instructor's grading policy for all students. (Note: Academic misconduct, which is covered by other regulations, can be a legitimate basis for lowering a grade or failing the student.)
6. Students as well as employees are bound by the University's policy against harassment in any form. Harassment will not be tolerated.
7. The office of the student's dean will be notified of any serious pattern or instance of disruptive behavior.

Honesty Policy

The purposes of this policy are to encourage a mature attitude toward learning to establish a sound academic morale, and to discourage illegitimate aid in examinations, laboratory, and homework.

Cheating is defined as using or attempting to use, giving or attempting to give, obtaining or attempting to attain, products or prepared materials, information relative to a quiz or examination or other work that a student is expected to do alone and not in collaboration with others. Plagiarism (copying) of themes or other written work shall also be considered an infraction.

Students are required to present the results of their own work except under circumstances in which the instructor may have requested or approved the joint effort of a number of students.

The penalty for the first offense of willful cheating consists of the student receiving a zero for the assignment in which the infraction occurs. However, cheating on quizzes or examinations means failure in the course. The student may appeal the decision to the Disciplinary Committee.

Further offenses may result in suspension or dismissal from the University.

CLLS 235 Fall 2003 Lecture Schedule

Date	Topic	Chapt Reading
Aug. 30	Introduction	
Sept. 3	Staphylococcus	10
Sept 6	No class meeting	
Sept. 10	Staphylococcus	10
Sept. 13	Streptococcus	11
Sept. 17	Streptococcus	11
Sept. 20	Gram positive Bacilli	12, 13
Sept 24	No class meeting	
Sept.27	Gram positive Bacilli	12, 13
Oct. 1	*Neisseria* sp./*Moraxella catarrhalis*	14
Oct. 4	*Neisseria* sp./*Moraxella catarrhalis*	14
Oct. 8	*Haemophilus* et al	15
Oct. 11	*Haemophilus* et al	15
Oct. 15	Enterobacteriaceae	16
Oct. 18	Enterobacteriaceae	16
Oct. 22	Enterobacteriaceae	16
Oct. 25	Misc. Gram negative bacilli	18
Oct. 29	Misc. Gram negative bacilli	
Nov. 1	Misc. Gram negative bacilli	18
Nov. 5	*Vibrio, Aeromonas, Plesiomonas*	17
Nov. 8	*Vibrio, Aeromonas, Plesiomonas*	17
Nov. 12	Nonfermentative bacilli	18
Nov. 15	Nonfermentative bacilli	18
Nov. 19	*Chlamydia* sp.	21, p.635
Nov. 22	*Mycobacterium* sp.	22
Nov. 26	*No class meeting*	21, p. 652
Nov. 29	*Mycobacterium* sp.	22
Dec. 3	Rickettsiae	21, p. 1076
Dec. 6	Spirochetes	20
Dec. 10	Potpourri	
Dec. 13	**Final Comprehensive EXAM: 12:00 – 13:40**	

Anaerobes: The anaerobe portion of this course will be delivered on line. There will be a separate handout for this. Stay tuned.

These schedules are tentative and subject to change, so be flexible.

CLLS 235 Lab Schedule
Fall 2003

Week #	Date	Topic
1	Aug. 31	Introduction to Clinical Microbiology Laboratory
	Sept. 1	In the Beginning there was: Basic Microbiology Techniques
	Sept. 2	In the Beginning there was: Basic Microbiology Techniques
2	Sept. 7	Let's Do Drugs: Chemotherapy and Susceptibility Testing
	Sept. 8	Let's Do Drugs: Chemotherapy and Susceptibility Testing
	Sept. 9	Let's Do Drugs: Chemotherapy and Susceptibility Testing
3	Sept. 14	Staphylococcus: "Can we make wine with these grapes?"
	Sept. 25	Staphylococcus: "Can we make wine with these grapes?"
	Sept. 16	Staphylococcus: "Can we make wine with these grapes?"
4	Sept. 21	Streptococcaceae or Something Along That "Line"
	Sept. 22	Streptococcaceae or Something Along That "Line"
	Sept. 23	Streptococcaceae or Something Along That "Line" **Written Lab Quiz**
5	Sept. 28	Throat Culture Hey Long, Dark, and Handsome! Aerobic Gram Positive Bacilli
	Sept. 29	Throat Culture Hey Long, Dark, and Handsome! Aerobic Gram Positive Bacilli
	Sept. 30	Throat Culture Hey Long, Dark, and Handsome! Aerobic Gram Positive Bacilli
6	Oct. 5	A Round of Applause for the Neisseriaceae
	Oct. 6	A Round of Applause for the Neisseriaceae
	Oct. 7	A Round of Applause for the Neisseriaceae
7	Oct. 12	Haemophilus: "Interview with a Bacilli"
	Oct. 13	Haemophilus: "Interview with a Bacilli"
	Oct. 14	Haemophilus: "Interview with a Bacilli"
8	Oct. 19	Sputum Culture
	Oct. 20	Sputum Culture
	Oct. 21	Sputum Culture **Practical Lab Exam 1 This should be fun**

CLLS 235 Lab Schedule
Fall 2003

Week #	Date	Topic
9	Oct. 26	Enterobacteriaceae: They all look the same to me!
	Oct. 27	Enterobacteriaceae: They all look the same to me!
	Oct. 28	Enterobacteriaceae: They all look the same to me!
10	Nov. 2	I've Got a Gut Feeling about Enterobacteriaceae
	Nov. 3	I've Got a Gut Feeling about Enterobacteriaceae
	Nov. 4	I've Got a Gut Feeling about Enterobacteriaceae
11	Nov. 9	Urine Culture CSF Culture
	Nov. 10	Urine Culture CSF Culture
	Nov. 11	Urine Culture CSF Culture
12	Nov. 16	And Now For Something Completely Different Nonfermentative Bacilli Blood Culture
	Nov. 17	And Now For Something Completely Different Nonfermentative Bacilli Blood Culture
	Nov. 18	And Now For Something Completely Different Nonfermentative Bacilli Blood Culture **Written Lab Quiz**
13	Nov. 23	Mycobacterium: "Acid Fast This, Pal" GC Culture
	Nov. 24	Mycobacterium: "Acid Fast This, Pal" GC Culture
	Nov. 25	No Lab: Turkey Day
14	Nov. 30	Stool Culture Sniff, Sniff, What Stinks? Anaerobes
	Dec. 1	Stool Culture Sniff, Sniff, What Stinks? Anaerobes
	Nov 2	Stool Culture Sniff, Sniff, What Stinks? Anaerobes
15	Dec. 7	Vibrio, Aeromonas, Plesiomonas: "They're NOT Enterobacteriaceae!" Aerobic Wound
	Dec. 8	Vibrio, Aeromonas, Plesiomonas: "They're NOT Enterobacteriaceae!" Aerobic Wound
	Dec. 9	**Lab Exam 2** **Boy, I'm glad this is OVER!**

CLLS 240 Medical Mycology, Parasitology and Virology **Winter 2005**

Credits: 2

Course Configuration: 1+3

Instructor: Daniel P. deRegnier, MS, MT (ASCP), VFS 408; 591-2327
E-mail: Daniel_P_deRegnier@ferris.edu
Office Hours: M,W,F: 11:00-12:00
W: 10:00-11:00
Other hours by appointment.

Course Description:

Fifteen week basic course covering theoretical and laboratory aspects of clinical mycology, parasitology, and virology, with an emphasis on correlation of laboratory data and basic problem-solving techniques used in the identification of clinically significant organisms.

Prerequisites:

Admission to the Clinical Laboratory Science Program

Class Schedule:

Lecture: On-line via WebCT
Lab: 2/5, 2/26, 3/19, 4/2, 4/16, 4/23

Required Textbooks:

Medical Parasitology A Self-Instructional Text, 4th ed.; Leventhal, Ruth and Russell F. Cheadle; F.A. Davis
Medical Mycology A Self-Instructional Text; Kern, Martha E; 2nd, F.A. Davis

Textbook of Diagnostic Microbiology, 2000, Mahon, Connie and George Manuselis, *2nd Ed, Saunders.* YOU SHOULD HAVE THIS ALREADY

Evaluations:

There will be three "comprehensive" exams following each major section, i.e. one following virology, one after mycology and one after parasitology. They will consist of multiple choice, matching, short answer, and essay. There will also be lab quizzes, e-mail questions, and a laboratory practical exam following the mycology and parasitology portions of the course. I use the standard CLS grading curve. Refer to your handbook for information regarding the grading scale. I also reserve the right to add assignments and extra credit exercises that will figure into the final grade.

Attendance Policy:

Although I am always crabby, I expect you to attend all lectures and labs, and will be even crabbier if you miss class. I do keep track of your attendance. Why? You ask. Because if you are less than a half of a percent away from the next highest grade I find if VERY difficult to justify rounding to that higher grade. You are responsible for all material handed out, both verbally and written. If you have to miss a lecture, please call (2327) or

e-mail (Daniel_P_deRegnier@ferris.edu) ahead of time. I must have adequate notice (24 hours) if you have to miss an exam. Failure to show up for an exam or quiz without prior notice will result in a zero for that exam or quiz, no exceptions. The same goes for lab. I have precious little time in lab. You must be there for each to collect the pearls of wisdom I will bestow upon you. Due dates for assignments and lab exercises are included when the assignment is made. There will be one point deducted for each day the assignment is late. Remember: no hats may be worn during laboratory periods. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

PLEASE REMEMBER: THIS SCHEDULE IS SUBJECT TO CHANGE. BE FLEXIBLE

Some General Notes about Virology:

Virology will be strictly lecture and case based. We do not have the facilities to culture viruses. This section is also not very long. I decided to put most of the effort into Mycology and Parasitology. The final virology exam will be a take home, consequently you may use any source (except faculty members, they may not be that much help anyway...why do you think I teach this course??!!) to your benefit. The downside is that I expect complete, detailed answers. You will have approximately 1 week to complete it.

I RESERVE THE RIGHT TO CHANGE ANY OR ALL OF THE ABOVE INFORMATION.

Some General Notes about Mycology:

Each lecture will begin with a quiz covering the material from the previous meetings; this includes what was covered in lab the Monday before. This is to establish if you have (or have not) been doing the reading (i.e. are you prepared for class). Each quiz will be worth 5.0 pts. I reserve the right to forget to administer a quiz, in which case everyone gets an automatic 5.0 pts for that day. My "level of forgetfulness" usually shows a direct correlation to previous quiz scores.

The mycology lab practical will consist of questions on specimen collection and handling, culture preparation, morphological descriptions of cultures and microscopic preparations, and identification of unknowns. There will be a microscope portion and a photograph portion. I will show you an image, ask a question pertaining to the image, and you will write the correct answer.

The written final exam for this section will consist of multiple choice, short answer, matching, and essay questions. Refer to the schedule for the date.

I RESERVE THE RIGHT TO CHANGE ANY OR ALL OF THE ABOVE INFORMATION.

Some General notes on Parasitology

Each lecture will begin with a quiz covering the material from the previous meetings; this includes what was covered in lab the Friday before. This is to establish if you have (or

have not) been doing the reading (i.e. are you prepared for class). Each quiz will be worth 5.0 pts . I reserve the right to forget to administer a quiz, in which case everyone gets an automatic 5.0 pts for that day. My "level of forgetfulness" usually shows a direct correlation to previous quiz scores.

You will also be required to make a notebook for parasitology. It will include neat factoids about each parasite (like infective stage and diagnostic stage). Little, cute drawings will also help you learn these organisms. Think of if as arts and crafts. It will take your mind off chemistry, at least! I will have preformatted sheets for you to use. This notebook will be due no later than the scheduled day of the final exam for parasit. You will lose all 50 points if this is not turned in by the deadline. If you feel that you cannot make this deadline, you must submit a written request for extension. The request must include why you cannot make the deadline and a new date that the completed notebook will be submitted. The request must be typewritten and formally addressed. I will evaluate this request and approve or deny your request. If your request is denied by me you have the right to request another CLS faculty member evaluate your request and I will abide by their decision if it is different from mine.

Organisms to be included in the parasitology notebook:

Giardia lamblia
Chilomastix mesnili
Clonorchis sinensis
Diphyllobothrium latum
Endolimax nana
Naegleria fowleri
Schistosoma japonicum
Taenia sp.
Trichuris trichiura
Trypanosoma cruzi
Trypanosoma gambiense
Entamoeba coli
Entamoeba hartmanni
Schistosoma mansoni
Hookworm
Iodamoeba butschlii
Enterobius vermicularis
Ascaris sp.
Strongyloides larvae
Paragonimus westermani
Echinococcus granulosus
Ehrlichia sp.
Balantidium coli
Entamoeba histolytica
Schistosoma haematobium
Fasciola hepatica
Dientamoeba fragilis
Plasmodium falciparum
Fasciolopsis buski
Hymenolepis diminuta
Leishmania donovani
Trichinella spiralis

Note that all of these organisms will be available in lab, but not all will be studied as part of the lab procedure. It is up to you to use available lab time or use scheduled open labs to look at those organisms not included in lab procedure but are included on this list.

The lab practical will consist of questions on specimen collection and handling, morphological descriptions of diagnostic and infective forms, and identification of unknowns using wet mounts, prepared slides or stained preparations. There will be a microscope portion and a photograph portion. I will show you an image, ask a question pertaining to the image, and you will write the correct answer. This portion of the exam will be given during the last laboratory meeting.

The written final exam for this section will consist of multiple choice, short answer, matching, and essay questions.

I RESERVE THE RIGHT TO CHANGE ANY OR ALL OF THE ABOVE INFORMATION.

I can't think of anything else. Should there BE anything else?? If there is, I will add it.

CLLS 240 Medical Mycology, Parasitology and Virology
Course Objectives

Virology Portion of CLLS 240

At the end of this section the student should be able to:

1. Describe the characteristics of viruses and differentiate these organisms from bacteria.
2. Describe how viruses multiply.
3. Describe the proper procedures for collection and transport of viral specimens.
4. Name the appropriate specimen for maximum recovery of the suspected viral agent.
5. Describe the different methods used in the diagnosis of vial infections.
6. Explain the advantages and limitations of conventional tissue culture.
7. Explain the advantages and limitations of rapid viral antigen detection methods.
8. Discuss the indications and limitations of serologic assays in the diagnosis of viral infections.
9. Define cytopathic effect (CPE) and describe how it is used to presumptively identify viral agents.
10. For each of the viral agents presented in this chapter, discuss how the virus is transmitted or acquired, the infection it produces, and the effective method of laboratory diagnosis.
11. Distinguish between passive and active immunization.
12. List the properties for a good antiviral agent.
13. Discuss some of the problems with vaccine use.
14. Describe the mechanism of action and on what viruses the following antiviral agents are used:
    - Amantadine
    - Acyclovir
    - Azidothymidine
    - Ribavirin
15. Correctly spell the names of all viruses covered

Mycology Portion of CLLS240

At the end of this section the student should be able to:

1. Correctly recognize the following:

hyphae	mycelium	aseptate hyphae
septate hyphae	vegetative hyphae	aerial hyphae
arthroconidia	blastoconidia	pseudohyphae
phialoconidium	sporangiospore	sporangiophore
sporangium	ascospore	ascus
basidospore	basidium	zygospore
macro/microconidia	chlamydoconidia	

2. Define:

fungus	sessile	cutaneous mycosis
mycology	intercalary	subcutaneous mycosis
dimorphism	systemic mycosis	superficial mycosis
saprobe	opportunistic pathogen	dematiaceous
dermatophyte		

3. Given a fungal culture, accurately describe its texture, topography, and color

4. State whether infected material from a specific body site represents a superficial, cutaneous, subcutaneous, or systemic mycosis.

5. Given an unknown fungus, correctly identify if using identification keys.

6. List at least four general rules for good fungal specimen collection.

7. Correctly process a fungal specimen from a given body source.

- 7a. Selection of proper media to isolate most probable organisms for given body site
- 7b. Utilization of techniques that reduce hazards (chemical and biological)

8. List a least two fungi that may be found at a given body site.
9. Discuss the types of specimen direct examinations, including the principle, procedure, and appearance of fungi in each. (Saline wet mount, LPCB wet mount, KOH prep, gram stain, acid fast stain, India ink prep)

9a. Perform direct mounts of specimens or fungus cultures and observe them under a microscope

9b. Correctly describe morphological features seen during microscopy of direct mounted specimens.
10. From fungal colonies and/or microscopic preparations recognize each fungus studied:
12. Briefly, describe the following mycoses and state which organisms cause each. State common mycosis names where appropriate:

pityriasis versicolor	tinea nigra	black piedra
white piedra	tinea capitis	tinea barbae
tinea corporis	tinea cruris	tinea pedis
tinea unguium	blastomycosis	paracoccidioidomycosis
histoplasmosis	coccidioidomycosis	

13. Correctly spell the names of all fungi covered.

Parasitolgy Portion of CLLS 240

At the end of this section the student should be able to:

1. State definitions for general terminology used in parasitology.
2. Recall the scientific and common name for each parasite studied.
3. Describe the general geographic distribution of each parasite.
4. Identify the infective and diagnostic forms of each parasite.
5. State the appropriate body specimen to examine for the diagnostic stage of each parasite.
6. Discuss the procedures used to identify parasites including concentrations, culture, and stains.
7. Explain the procedure for calibrating an ocular micrometer.
8. Perform microscopic examination of stool to detect and identify parasites.
9. Perform at least two fecal concentrations.
10. Perform a permanent stain for examination.
11. Perform a saline and iodine wet mounts for examination.
12. Correctly spell the names of all parasites covered.

CLLS 251: Basic and Clinical Immunology Summer 2003

Daniel P. deRegnier, MS, MT (ASCP)
deregnid@ferris.edu
VFS408 591-2327

Credits: 3

Office Hours
M-R: 11:30-12:20
Other hours by appointment

Course Description:

Study of host defense systems and mechanisms and their relationships, with emphasis on the principles and techniques of clinical laboratory procedures utilized to determine functioning of these systems and mechanisms.

Lecture Schedule:
W,F: 08:00-09:35 Room: VFS 425

Lab Schedule
Section 211: T, R, 13:00 – 14:35
Section 212: W, F: 13:30 - 14:35
Room: VFS421

Textbooks:

Required: Clinical Immunology and Serology: A Laboratory Perspective 2nd
Stevens, Christine; F.A. Davis 2003

Supplemental texts: There are a variety of textbooks in room 421.

Prerequisite:

Admission to Clinical Laboratory Sciences program or permission from the instructor.

Evaluations:

There will be three lecture exams, including a **comprehensive** final. There will be two laboratory exams, including a **comprehensive** final. The exams will consist of multiple choice, matching, short answer and/or essay questions. The lab exams will also consist of practical problems. The standard CLS grading system will be used. Refer to your handbook. I may also be sending you interesting tidbits via e-mail. Some will be FYI, but some will be associated with a quiz question. All you have to do is answer the question, and then e-mail right back. I do not know how many of these there will be during the course of the semester.

Lecture: 50% of your grade
Laboratory 50% of your grade

Attendance Policy:

This is an interesting and challenging course and will be moving very fast. Please make every effort to attend all class meetings. You will be responsible for all material handed out in lab and lecture. If you have to miss a lecture for any reason, please let me know ahead of time. Twenty-four hours would be nice, but I know that is not always possible. Call my office (591-2327) and leave a message...I have voice mail. I must have adequate notice (24 hours, if possible) if you are going to miss an exam. If you fail to show up for an exam without checking with me you will get a zero for that exam. No exceptions. The same goes for missing a lab. If you skip a lab without a reasonable excuse that was cleared with me ahead of time, you will not have the opportunity to make up that lab. My fragile ego will also be wounded. Due dates for assignments and lab exercises are included when the assignment is made. There will be one point deducted for each day the assignment is late. I routinely give hand outs at the beginning of lecture and lab. Once the class is over for the day, those handouts will no longer be available from me, so I suggest you come to class everyday. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

WILT (What I Learned Today) Forms:

Each day before lecture you will receive a WILT form. An example is shown below. At the end of class, fill them out and I will collect the forms. The beginning of the next meeting I will go over some of the questions that may be giving your problems. I use the information to help direct your learning. Each form is worth 5 points.

- Here is one thing I learned in class today that I didn't expect to learn:
- Here is one question I have about the topic after today's class:
- Here is one concept covered in today's class that I still don't understand:

Other stuff:

Please turn your cell phone off before class begins. You may not leave the room to talk on phone. If you do, don't plan on coming back in. This goes for lecture and lab. You may use it during any breaks we have during class. Please be aware that there are classes and offices nearby so please keep your conversation volume low. Remember to turn it off before you return.

Please check your imail accounts on a regular basis. If I send you email it will be to your imail account.

No hats may be worn in lab.

Lecture Schedule

Day	Topic	Chapter Reading
5/18, W	Introduction; video; Normal Immune Responses Natural Immunity	2
5/20, F	Terminology Exercise; Lymphoid system Cellular Components of the Immune System	3
5/25, W	Stimulators of the Immune Response: Antigens	4
5/27, F	Major Histocompatibility Complex: MHC	4
6/1, W	**Exam 1**	
6/3, F	Soluble Mediators of the Immune Response: Antibodies	5
6/8, W	No Class	
6/10, F	Soluble Mediators of the Immune Response: Antibodies	5
6/15, W	Soluble Mediators of the Immune Response Cytokines	6
6/17, F	Soluble Mediators of the Immune Response: Complement	7
6/22, W	**Exam 2**	
6/24, F	Hypersensitivity Reactions	13
6/29, W	Hypersensitivity Reactions	13
7/1, F	Autoimmunity	14
7/6, W	Immunodeficiency/Immunoproliferative diseases	15, 16
7/8, F	Immunodeficiency/Immunoproliferative diseases	15, 16
7/13, W	HIV	22
7/15, F	**Exam 3**	
7/20, W	HIV	22
7/22, F	Transplantation Immunology	17
7/27, WT	Transplantation immunology	17
7/29, F	Tumor immunology	18
8/3, W	Current Topics in Immunology	
8/5, F	Potpourri/Review	
8/10, W	**Final Exam**	

Lectures are scheduled to run 1 hours and 05 minutes. Plan on staying the entire time

As with everything in life, nothing is certain. This also includes the lecture and laboratory schedules. So, be flexible. I am!

Laboratory Schedule

Day	Topic
5/17, 18	No Lab
5/19, 20	Agglutination reactions: Cold agglutinins, Rheumatoid Factor
5/24, 25	Agglutination reactions: Infectious mononucleosis
5/36, 27	Agglutination reactions: Syphilis testing
5/31, 6/1	Precipitation reactions: Radial Immunodiffusion
6/2, 3	Precipitation reactions: Immunofixation
6/7, 8	No Lab
6/10	ELISA with Robyn Myers
6/14, 15	Labeling techniques: Enzyme immunoassays: Pregnancy testing
6/16, 17	Labeling techniques: Fluorescent immunoassays: ANA
6/21, 22	**Lab Exam 1**
6/23, 24	Labeling techniques: Fluorescent immunoassays: ANA
6/28, 29	Streptococcal serology: ASO titer and strep screens,
6/30, 7/1	Miscellaneous Techniques: SUDS, CRP
7/5, 6	TBD
7/7, 8	TBD
7/12, 13	TBD
7/14, 15	TBD
7/19, 20	TBD
7/21, 22	TBD
7/26, 27	TBD
7/28, 29	TBD
8/2, 3	TBD
8/4, 5	TBD
8/9, 10	**Final Lab Exam**

Labs are scheduled to run 1 hours and 35 minutes. Plan on staying the entire time

Objectives: After finishing this course, the student should be able to:

- Define immunity and immunology.
- Discuss the role of Jenner, Pasteur, and Koch and their contributions to immunology.
- Define vaccination.
- Distinguish a hapten from an antigen.
- Describe, in general terms, antibodies.
- Define natural immunity
- Differentiate between external and internal defense systems.
- Describe phagocytosis.
- Describe the types of white blood cells capable of phagocytosis.
- Describe acute phase proteins and their significance in human disease.
- Outline the steps of inflammation.

♦ Differentiate between primary and secondary lymphoid organs.
♦ Describe the function of the lymph node.
♦ Discuss the role of the thymus in T cell maturation.
♦ Describe the maturation of a B cell from the pre-B cell to a plasma cell.
♦ What does CD stand for?
♦ Outline the function of CD2, CD3, CD4, and CD8.
♦ Describe what a cytokine is.
♦ Differentiate T cell subsets based on antigenic structure and function.
♦ Explain how natural killer cells differ from cytotoxic T cells.
♦ Describe how fluorescent antibody staining is applied to detection of surface immunoglobulin on B cells.
♦ Apply knowledge of T and B cell function to immunologically based disease states.

© Define antigen, epitope, hapten, adjuvant, and carrier.
© Discuss the role of adjuvants.
© Identify the characteristics of antigens and haptens.
© Define HLA and MHC
© Describe the differences in distribution of class I and class II proteins.
© Compare the transport of antigen to cellular surfaces by class I and class II proteins.
© Discuss the differences in the source and types of antigen processed by class I and class II molecules.

- Describe the structure of a typical immunoglobulin.
- Characterize the 5 immunoglobulin types found in humans.
- Differentiate between light and heavy chains.
- Relate immunoglobulin structure to function.
- Compare template theory with clonal selection theory.
- Explain antibody diversity.
- Define monoclonal antibody and describe their formation.

⇒ Differentiate CMI from humoral immunity.
⇒ Define cytokine, lymphokine, interleukin, and tumor necrosis factor.
⇒ Discuss the function and CD4 and CD8 markers in T cell activation.
⇒ Discuss how T helper cells participate in CMI and humoral immunity.
⇒ Discuss the central role of IL-1, IL-2, and IL-3.
⇒ Distinguish the interleukins that affect B cell maturation.
⇒ Describe the cytotoxic effects of tumor necrosis factors against virally infected and tumor cells.

♣ Describe the nature of the complement components.
♣ Differentiate between the classical and alternative pathways.
♣ Discuss the formation of the three principle units of the classical pathway: recognition, activation, and membrane attack units.
♣ Explain how C3 plays an essential role in both pathways.

- ♣ Describe the fluid-phase regulators of the complement system.
- ♣ Relate biologic manifestations of complement activation to generation of specific complement products.
- Ϯ Define hypersensitivity, atopy, and allergen.
- Ϯ Discuss the essential immunologic reactant involved in immediate hypersensitivity.
- Ϯ Describe the changes that take place in IgE-coated mast cells and basophils when binding with specific antigen occurs.
- Ϯ Characterized the mediators released from basophils and mast cells when an allergic reaction takes place.
- Ϯ Describe anaphylaxis.
- Ϯ Define skin testing, RAST, and RIST.
- Ϯ Describe type II, III, and IV hypersensitivity reactions and give an example of each.
- ¥ Define autoimmunity and describe the factors that contribute to the development of autoimmunity.
- ¥ Distinguish organ-specific and systemic autoimmune diseases.
- ¥ Describe SLE and RA.
- ¥ Distinguish Hashimoto's thyroiditis and Grave's Disease and characterize them immunologically.
- Discuss the autoimmune nature of MS, myasthenia gravis, and Goodpasture's syndrome.
- Discuss the role of MHC in antigen recognition.
- Distinguish autograft, syngraft, allograft and xenograft.
- Differentiate hyperacute, acute, and chronic rejection phenomena.
- Explain the lymphocytotoxicity test, the MLR and discuss their application.
- Describe therapies used to counter tissue rejection.
- Define tumor associated antigen and give examples.
- Compare and contrast the response of NK cells and cytotoxic lymphs to tumor cells.
- Describe the use of monoclonal antibodies, cytokines and lymphokine-activated killer cells (LAK) in cancer therapy.
- Distinguish between: common variable immunodeficiency, Bruton's X-linked agammaglobulinemia, DiGeorge anomaly, severe combined immunodeficiency, Wiskott-Aldrich syndrome, and ataxia-telangiectasia.
- Describe how uncontrolled proliferation of lymphoid cells and overproduction of antibody can lead to clinical manifestations.
- Differentiate multiple myeloma, Waldenström's macroglobulinemia, and polyclonal gammopathies.
- Define the clonal hypothesis of malignancy.
- Explain the significance of loss of neutrophil function to host defenses.

CLLS 435 Advanced Diagnostic Microbiology
Winter 2005 Session B

Credits: 4
Course Configuration: 4 + 10

Instructor: Daniel P. deRegnier, MS, MT(ASCP)
VFS 408, 591 - 2327
deregnid@ferris.edu

Office Hours: M: 10:00-11:00
T, R: 9:00 – 11:00
Other hours by appointment.

Course Description:

Advanced course covering the theoretical and laboratory aspects of clinical microbiology with an emphasis on pathogenic manifestations of disease in humans, correlation of laboratory data, quality assurance in the clinical laboratory, and extensive problem solving techniques used in the identification of clinical significant microorganisms. **Prerequisite:** CLLS 235 or my official okee-dokee

Lecture Schedule

M: 1:00 – 1:50
T,R: 12:00 – 1:15
Room 420

Laboratory Schedule

Weekday	Lab Time
Monday	9:00 – 11:50
Wednesday	9:00 – 10:50
Thursday	9:00 – 10:50
Friday	9:00 – 11:50

Lab will meet in room 421

Textbooks:

Required: *Textbook of Diagnostic Microbiology,* 2000, Mahon, Connie and George Manuselis, *2nd Ed, Saunders*. You should have this already

ASM Pocket Guide to Clinical Microbiology, 3rd, Murray, Patrick; ASM Press
You probably don't have this one, yet!

Evaluation:

I want to make sure that you are keeping up with the work, so I will post a quiz each Friday that will cover that material from the week just finished. The quizzes will be about 10-15 points. I will problably put them on a WebCT course.

This course will teach organism identification, from specimen processing to susceptibility testing, using a case-based approach. We will discuss many different specimen types in the context of a clinical case(s). You will receive two copies of each case, which also includes a set of study questions. One copy of the study questions will be turned in BEFORE the classroom session begins. They will NOT be accepted after I begin. The

second copy of the question set will be for you to make notes on. Each question set will be worth 10 points. I will return your original question set after I have graded them.

There will also be 4 lecture exams, about every other week. I don't know exactly how many points these will be worth because I haven't written them yet. They are usually around 50 points each.

Laboratory performance will be evaluated based on your ability to identify the organism(s) in the clinical specimens. Each one of you will have her/his own unknowns and will turn in your own work card. Each unknown will be worth 5 points. I don't know how many you will have. We'll have to wing it. I have the right to reduce or increase the number of unknowns.

Oh yeah, I almost forgot, YOU will also be doing a case study presentation. It will be worth 50 points. It will work something like this: you will draw, at random, from a container, the organism name and they order in which you will present. It may be a bacterium, viruses, fungus, or parasite. Then YOU will choose a body site in which your organism would be of clinical significance. Next, you will proceed to create a plausible case study and present it to the class using Microsoft PowerPoint. Your case presentation should have at least 6 no more than 10 slides. (We will have a lesson on using Microsoft PowerPoint, if necessary). You will have to include: patient history, other lab data if it is necessary, and information about your organism such as growth requirements, cultural characteristics, biochemical identification, clinical significance, mechanisms of pathogenicity, and antimicrobial susceptibility. Then you will supply, to your classmates, and me, 5 original, unique, and challenging questions. Mix up the style of question; in other words, don't write 5 True or False. You must include at least one short answer. You never know, I might just add some of these to the exams and quizzes (wink, wink, nudge, nudge, you know what I mean??). I will go through a sample case with you. These cases will be presented to the Supreme Being of Microbiology and, anyone else interested, during the last week or so of the course. They don't have to be very long, maybe 15 minutes with a few minutes at the end for questions (from me and your fellow students). We will also draw numbers for order of presentation. I am looking forward to this.

So, let's recap what we have so far:

Quizzes	15 points each	around 40 points (5%)
Question sets	10 points each	somewhere around 140 (17%)
Exams	about 50 points each	nearly 200 points (25%)
Unknowns	5 points each	close to 400 points (47%)
Case study presentation	50 points	exactly 50 points (6%)
Total		**Approximately 830 points**

Hmm, that should do it. Did I leave anything out? I know everyone is moaning and groaning about this case presentation. Well, stop your whining. It won't be that bad. I will give you more information later. If you want to get fancy, I may be able to get you some slides or at least some overheads to use. I'm looking forward to it... have I said that??.

Attendance:

This is an interesting and challenging course. Please make every effort to attend all class meetings. You will be responsible for all material handed out in lab and lecture. If you have to miss a lecture for any reason, please let me know ahead of time. Twenty-four hours would be nice, but I know that is not always possible. Call my office (591-2327) and leave a message...I have voice mail. I must have adequate notice (24 hours, if possible) if you are going to miss an exam. If you fail to show up for an exam or quiz without checking with me you will get a zero for that exam or quiz. No exceptions. The same goes for missing a lab. If you skip a lab without a reasonable excuse that was cleared through me ahead of time, you will not have the opportunity to make up that lab. My fragile ego will also be wounded. Due dates for assignments and lab exercises are included when the assignment is made. There will be one point deducted for each day the assignment is late. I routinely give hand outs at the beginning of lecture and lab. Once the class is over for the day, those handouts will no longer be available from me, so I suggest you come to class everyday. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

- University sponsored events in which an excused absence form from the University is presented to me.
- Death in the family or your death.
- Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
- Being called to testify in court, not for being arrested.
- Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only.

One more thing, HATS MAY NOT BE WORN DURING MICROBIOLOGY LABORATORY. .

I reserve the right to change any or all of the above.

GENERAL POLICIES:

Student Dignity

The University expects all students and employees to conduct themselves with dignity and respect for students, employees, and others. It is each individual's responsibility to behave in a civil manner and make responsible choices about the manner in which they conduct themselves. Harassment of any kind is ***not acceptable*** at Ferris State University. The University does not condone or allow harassment of others whether engaged in by students, employees, supervisors, administrators, or by vendors or others doing business with the University.

Harassment is the creation of a hostile or intimidating environment in which verbal or physical conduct, because of its severity or persistence, is likely to significantly interfere with an individual's work or education, or adversely affect a person's living conditions.

To assist with the understanding of what harassment is, this policy contains specific definitions of two of the more prevalent types of harassment – racial harassment and sexual harassment.

Harassment

Racial harassment includes any conduct, physical or verbal, that victimizes or stigmatizes an individual on the basis of race, ethnicity, ancestry, or national origin. Such behavior could involve
verbal conduct, intentional or otherwise, that has the purpose or effect of (or explicitly or implicitly threatens to) interference with an individual's personal safety, academic efforts, employment, or participation in University-sponsored activities.

The attributes of racial harassment described above are also the attributes of most other types of harassment that can occur. Harassment may be based upon a person's status that is protected by law (i.e., religion, veteran status, handicap, etc.), or may be for some other reason not specifically covered by law. In any event, harassment of any type is ***not acceptable*** at Ferris State University.

Sexual Harassment

Using the definition contained in the Equal Employment Opportunity Commission guidelines, adapted to include educational environments, sexual harassment is defined as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) submission to such conduct is made either explicitly or implicitly term or condition of an individual's employment or academic advancement;
2) submission to or rejection of such conduct by an individual is used as a factor in employment or academic decisions affecting such individuals;
3) such conduct has the purpose or effect of substantially interfering with an individual's work or academic performance, or creating an intimidating, hostile, or offensive working, living, or academic environment.

While sexual harassment most often takes place in situations of power differential between the persons involved, sexual harassment may also occur between persons of the same status, e.g., student-to-student. The person exhibiting sexually harassing conduct need not realize or intend the conduct to be offensive for the conduct to constitute sexual harassment.

Harassment Concerns

Any person who believes he or she has been subjected to harassment <u>of any kind</u> (sexual, racial, or otherwise) should approach the individual whom they believe is responsible. He or she should identify the specific behavior, explain that he or she considers the behavior to be offensive and/or harassing, and ask the individual to stop the behavior. If assistance is needed to approach the individual, contact either an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, or the Director of Affirmative Action.

If approaching the individual is not possible (i.e., you are uncomfortable or uncertain as to how the situation should be handled or concerned the situation may become volatile) or does not resolve the matter, it should then be reported immediately to an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, the Director of Student Judicial Services, or the Director of Affirmative Action. If, for some reason, you are uncomfortable discussing your situation with any of these individuals, please report your situation to any

member of University administration. The circumstances surrounding the matter will be fully investigated, including the nature of the harassment and the context in which it occurred.

All reports of harassment and subsequent investigations will be kept as confidential as possible. Anyone found to have violated this Policy will be subject to discipline up to and including discharge and dismissal that may include, but not be limited to, official reprimand, official apology, sensitivity training, and/or other disciplinary action including dismissal. Likewise, because intentionally false accusations of harassment can have serious effects on innocent people, anyone found to have intentionally falsely accused another person of violating this Policy will be subject to discipline up to and including discharge or dismissal.

Disruptive Behavior Policy Statement

The College of Allied Health Sciences strives to maintain a positive learning environment and educational opportunity for all students. Consequently, patterns of behavior which obstruct or disrupt the learning environment of the classroom or other educational facilities will be addressed.

1. The instructor is in charge of the course. This includes assignments, due dates, methods and standards of grading, and policies regarding attendance, tardiness, late assignments, outside conferences, etc.
2. The instructor is in charge of the classroom. This includes the times and extent to which they allow questions or discussion, the level of respect with which they and other students are to be treated, and the specific behaviors they will allow within their classes. Open discussion of an honest opinion about the subject of a course is encouraged, but the manner in which the class is conducted is a decision of the instructor.
3. If a student persists in a pattern of recurrent disruptive behavior, then the student may be subject to administrative action up to and including an involuntary withdrawal from the course, following administrative review by the Allied Health Sciences Dean's Office, and/or University disciplinary proceedings.
4. Disruptive behavior cannot be sanctioned by a lowered course grade (e.g., from a B to a C) except insofar as quality of classroom participation has been incorporated into the instructor's grading policy for all students. (Note: Academic misconduct, which is covered by other regulations, can be a legitimate basis for lowering a grade or failing the student.)
6. Students as well as employees are bound by the University's policy against harassment in any form. Harassment will not be tolerated.
7. The office of the student's dean will be notified of any serious pattern or instance of disruptive behavior.

Honesty Policy

The purposes of this policy are to encourage a mature attitude toward learning to establish a sound academic morale, and to discourage illegitimate aid in examinations, laboratory, and homework.

Cheating is defined as using or attempting to use, giving or attempting to give, obtaining or attempting to attain, products or prepared materials, information

relative to a quiz or examination or other work that a student is expected to do alone and not in collaboration with others. Plagiarism (copying) of themes or other written work shall also be considered an infraction.

Students are required to present the results of their own work except under circumstances in which the instructor may have requested or approved the joint effort of a number of students.

The penalty for the first offense of willful cheating consists of the student receiving a zero for the assignment in which the infraction occurs. However, cheating on quizzes or examinations means failure in the course. The student may appeal the decision to the Disciplinary Committee.

Further offenses may result in suspension or dismissal from the University.

Objectives:

At the end of this course, the student will be able to:

- ☺ List the common organisms associated with infectious disease of various human body sites.
- ☺ Discuss the antibiotic therapy common etiologic agents of infectious disease.
- ☺ Describe the importance of infection control in a clinical setting
- ☺ Create a case study for formal presentation

Lecture Schedule (Tentative)

Date	Topic
R, 3/3	Introduction/Upper Respiratory Tract
M 3/14	Upper Respiratory Tract/
T. 3/15	Lower Respiratory Tract
R, 3/17	Lower Respiratory Tract
M, 3/21	Urinary Tract
T, 3/22	Urinary Tract
R, 3/24	**Easter Break, No class**
M, 3/28	Gastrointestinal Tract
T, 3/29	Gastrointestinal Tract **Exam 1**
R, 3/31	Blood Cultures
M, 4/4	Blood Cultures
T, 4/5	Central Nervous System Cultures
R, 4/7	Central Nervous System Cultures **Exam 2**
M, 4/11	Skin and Tissue Cultures
T, 4/12	Skin and Tissue Cultures
R, 4/13	Genital Tract Cultures
M, 4/18	Genital Tract Cultures
T, 4/19	Infection control **Exam 3**
R, 4/20	**No Class: MSCLS Meeting**
M, 4/25	Cases: 1, 2, 3, 4
T, 4/26	Cases 5, 6, 7, 8
R, 4/28	Cases: 9, 10, 11, 12
	Final Exam

CLLS256: Simulated Clinical Laboratory

Syllabus and Course Description

Winter 2003

Instructors

Name	Daniel P. deRegnier	Barbara Ross
Credentials	MS, MT(ASCP)	AB, MT(ASCP)
Office	VFS 408	VFS 304B
Phone	591-2327	591-2317
E-mail	deregnid@ferris.edu	Rossb@Ferris.edu
Office Hours	M,W,F: 11:00-12:00 W: 10:00-11:00	M, W: 9:00 – 10:50

Credits: 2.0 Configuration: 0+12

Course Description: Eight-week course for students in the AAS Medical Laboratory Technician program at Ferris State University. Students apply previously acquired theory and techniques in a simulated clinical laboratory, with emphasis on work organization, quality control/quality assurance, following prescribed strategies for recognizing problems (instrumental and technical), record keeping and correlation of results with patho-- and normal physiology.

Prerequisites: CLLS228, 230, 235 or equivalents; **Co-requisites**: CLLS240,

Meeting Time: TWR 13:00PM to 16:50PM; **Location**: Rooms 421, 103 and 104 VFS

Evaluation:

Lab Skills	50%
Exams (4)	20%
Take Home/on-site quizzes	20%
Comprehensive Exam	10%

Lab skill and assignment grades are divided according to the amount of time spent in each department:

Department	Skills	Assignments
Chemistry	6/24 x 0.6 = 15%	6/24 x 0.24 = 6%
Blood Bank/Serology	5/24 x 0.48 = 10%	5/24 x 0.192 = 4%
Microbiology/Immunology	6/24 x 0.6 = 15%	6/24 x 0.24 = 6%
Hematology/UA/Coag	5/24 x 0.48 = 10%	5/24 x 0.192 = 4%

EXAMS:

There will be four subject exams given during this course, covering the major areas of clinical lab science. They are comprehensive, multiple-choice exams. You will take the subject exam on the last day of your rotation in each department (subject) areas. The exam will take about one hour to complete.

Each of these exams will be 5% of your grade. Your grade will be compared to the grades from everyone else who has taken the exam. If your score is equal to the mean score of previous students, you get 4%. If your score is equal to the mean plus one standard deviation, you get

5%. If your score is equal to the mean minus one standard deviation, you get 3%. If your score is equal to the mean minus two standard deviations, you get 2%. If your score is equal to or less than the mean minus three standard deviations you get 1%

The Big Exam: The first day of CLLS 256, everyone gets a big exam covering clinical laboratory science (about 100 questions). **Your score on this exam will be 10% of your course grade for CLLS 256.** Students who score 60% or better on this exam will be excused from repeating it on the date scheduled for the CLLS 256 final. Students who score less than 60% **must** retake the exam on the last day of CLLS256. We consider a score of 60% to be an indication that you know enough to benefit from clinical experience.

Date	Day	Department	Date	Day	Department
T: 1/14	Introduction to Sim Lab; Big Exam		**W: 2/12**	**13**	Hematology
W: 1/15	1	Microbiology	**R: 2/13**	14	Hematology
R: 1/16	2	Microbiology	**T: 2/18**	15	Hematology
T: 1/21	3	Microbiology	**W: 2/19**	**16**	**Hematology**
W: 1/22	4	Microbiology	**R:2/20**	17	Hematology
R: 1/23	5	Microbiology	T: 2/25	18	Blood Bank
T: 1/28	6	Microbiology	W: 2/26	19	Blood Bank
W: 1/29	7	Chemistry	R: 2/27	20	Blood Bank
R: 1/30	8	Chemistry	T: 3/4	21	Blood Bank
T: 2/4	9	Chemistry	W: 3/5	22	Blood Bank
W: 2/5	10	Chemistry	**R: 3/6**	**F.O.G and Big Exam for Some**	
R: 2/6	11	Chemistry			
T: 2/11	12	Chemistry			

Miscellaneous

At the beginning of each day, you will be given a quiz or an assignment dealing with some aspect of the department. The quiz is to be finished during the first 15 minutes. The assignment is to be turned in at the start of the next day's lab. You may work on the assignment during lab time, if you are on break or workload has been completed. You may take the assignment home to work on it. It is an open book assignment. The idea is to make sure you have thought about what you will be doing in lab BEFORE you get to lab and not the moment you show up. (HINT HINT HINT!)

The schedule is found above. Make sure you know what department you will be working in.

If you are sick, you MUST PHONE IN (591-2268). If you miss time, you need to make it up. See the appropriate instructor to make arrangements. Don't assume that we know your plans. Don't assume the lab will be available when you want to come. We have other classes scheduled also. Moreover, don't assume we will forget that you need to make up the time!

Generally, your day will proceed as follows (each department will be a little bit different)

13:00-1345	Clock in, Topic Review Session or quiz (subject to instructor availability)
1346-1415	Organize workload Prepare worksheets Perform and document instrument maintenance Find specimens
1416-1630	Perform testing Take a 15-minute break
1631-1650	Clean up Complete paperwork/documentation and turn in Store specimens Clock out and go Home

You are allowed at 15-minute break during the lab period. You are expected to stay to the end of each lab period. Don't plan to leave early. Your work may be done, but most likely, somewhere else in the lab needs help. You need to work as a TEAM. If all the work has been completed, the instructor may release you, if you ask nicely and the lab is all cleaned up

On some days, the workload will be deliberately more than you can probably do in the four hours. This is designed to see how you deal with stress. On these days when workload or other situations prevent you from completing the assigned work ask for help from the department supervisor (instructor). Ask for help from your colleagues. If your work is done offer to help someone else. WORK AS A TEAM!

If you have to store specimens overnight: MAKE SURE YOU FOLLOW PROCEDURE! Don't set it out on the bench and expect it to magically find the freezer/refrigerator/incubator. Also, make out an order for the test to be done tomorrow, otherwise tomorrow's crew won't know about it.

If you run out of reagents: Find them, get them, or make them! That is part of the job. Check for all reagents needed before you start so you don't find out half way through you need more acetic acid for electrophoresis. In addition, don't put back bottles/supplies that are not enough for the next user. Put them back in the right place too!

If the phone rings, answer it! Say, "Clinical Lab Sciences, this is _____." Expect the phone to ring (doctors etc. will be calling for lab results). Don't be afraid to answer it.

STAT tests are ordered because the results are needed right away. When a STAT arrives, it should be taken care of IMMEDIATELY! Results should be reported as soon as they are available. Telephone results to the designated number or hand them to an instructor.

The colored slips you may have used in other courses (e.g. the white work-up cards in micro) to record results on may also be used in Sim Lab. These records end up in the patient's file. SO...don't keep them around while you are working. They attract blood, stain, and stool. etc.

Work logs will tell you what to do on each patient. These stay in the lab and its okay to get them "dirty." Keep these at your workstation to follow the work that you have done. Be sure to record calibrators, controls along with the patients. We use the worksheets to determine how much work you have performed. If you don't record when you run calibrators or controls the lab looks like it doesn't do much work! If you have to run calibrators or controls more than once, be sure to record that. If you do the work, record it!

Correct errors on reports with a single line drawn through the error, your initials, and the corrected result next to it. If it looks even semi illegible after you make the correction, fill out a brand new form! More errors occur because of handwriting and paper work than anywhere else does! NO PENCIL, NO WHITEOUT, NO ERASING! Fill in ALL paperwork with INK (not pink, purple, orange, preferably black ink, reason: blue and other "colors" do not always photocopy well)

Completed work should be entered into the lab information system.

Specimens come from the local hospital, faculty, controls etc. All are capable of transmitting disease! Be sure to follow universal precautions. Wear face masks or work behind a shield when working with blood gas instrumentation, opening tubes, using dilutors etc.

We try to provide adequate specimens. Just like a real lab, we will redraw when necessary, but just like a real lab, we won't be happy. If you put 2 ml of serum in a cup for the Axsym and only use 10 uL, DO NOT throw the extra away until you know that others won't need it! If you know that someone else will also need that patient specimen, take it to him or her when you're done with it (WORK AS A TEAM!)

This is a learning experience. We will push you to see what you can do, but don't be afraid to say, STOP! And let the faculty member know that you need to slow down or think about something a little longer. None of the faculty is a mind reader (we can't change things if no one tells us something doesn't work). Ask questions, try to find the answers yourself first, then ask your colleagues, then the faculty. There is no such thing as a dumb question. However, we do expect you to know what a gram-positive bacterium looks like, what a red cell looks like, and how to read and follow procedure manuals. Use the resources available.

CLLS256-- Simulated Clinical Laboratory
Course Objectives

General Objectives

Upon completion of this course, the student will be able to:

1) Follow the laboratory safety rules.
2) Demonstrate the ability to perform, maintain, and operate the procedures and instrumentation in each department by:
   a) Obtaining accurate results, as defined in each department.
   b) Following the procedure in the current manual.
   c) Preparing reagents, standards, and calibration curves, as necessary.
   d) Performing documenting the quality control procedures required.
   e) Recognizing when a procedure is out of control, and following departmental protocol to correct the problem.
   f) Repeating grossly abnormal or questionable results
   g) Performing scheduled preventive maintenance procedures.
   h) Performing appropriate start-up, shutdown, and clean-up procedures.
   i) Initiating trouble-shooting procedures, recognizing his/her limitations and asking for assistance when needed.
   j) Storing reagents, standards, materials, and equipment properly.
   k) Conserving patient specimens.
   l) Maintaining a neat work area.
3) Process specimens, including:
   a) Specimen is properly labeled.
   b) Verifying that test orders and specimens match.
   c) Specimen was collected in the proper container.
   d) Proper anticoagulant or preservative was used, as applicable.
   e) Specimen was collected at the proper time, as applicable.
   f) Specimen was properly handled, including storage, processing, and chain of custody, as applicable.
   g) Rejecting specimens that do not meet the criteria listed above.
   h) Ensuring prompt analysis for labile analytes or microorganisms.
   i) Storing specimens for later analysis, as necessary.
   j) Sharing specimens between departments, as necessary.

4) Report results accurately, legibly, in ink (on paper), and using correct units, abbreviations, spelling, and significant figures. Where appropriate, enter results accurately into the Laboratory Information System.

5) Process the following types of reports in the correct manner:

   a) Routine results reported correctly on requisitions.
   b) "Critical values" called to the physician.
   c) "STAT" results called to the physician or nursing station.
   d) Unusual data referred to the "Pathologist."

6) Demonstrate organizational skills by:

   a) Setting up tests requiring long incubations early.
   b) Performing more than one task at a time.
   c) Using waiting periods for documentation, replenishing reagents and supplies, or other necessary tasks.
   d) Establishing priority in workloads when STATs occur.
   e) Arranging work so that a break is possible.

7) Demonstrate a willingness to assume responsibility by:

   a) Arriving on time and beginning assignments as scheduled.
   b) Following proper procedure for reporting absence.
   c) Completing assignments on time.
   d) Volunteering for extra assignments, as appropriate.
   e) Explaining what has happened when work must be left for the next "shift."
   f) Reading orientation materials, maintenance schedules, procedure manuals, and other information on arrival in each department.

8) Demonstrate the ability to work compatibly with fellow students and instructors by:

   a) Being pleasant.
   b) Communicating with others.
   c) Responding to criticism by acting on suggestions for improvement.
   d) Being responsive to the needs of coworkers.

9) Demonstrate the ability to deal with patients and health care personnel with consideration.

10) Demonstrate self confidence by:

   a) Working independently.
   b) Having confidence in results.
   c) NOT seeking constant reassurance.
   d) Initiating problem solving.
   e) Seeking help where appropriate.

Knowledge

11) During this course, the student will demonstrate her/his knowledge of the theoretical background of clinical laboratory science by:

12) Completing examinations covering the major areas:

   a) Immunohematology and serology.
   b) Clinical chemistry.
   c) Hematology, coagulation, urinalysis.
   d) Microbiology, immunology, serology.

13) Answering daily assigned questions by:

   a) Selecting appropriate references.
   b) Applying knowledge acquired in previous courses.
   c) Completing answers in a timely manner.

14) Participating in periodic team competitions, as assigned.

15) Applying knowledge to laboratory practice, including (but not limited to):

a) Recognizing errors, critical values, unreasonable results, and out-of-control situations.
b) Selecting and performing appropriate actions to resolve the problems defined.
c) Consulting with faculty, "physicians," and others, as needed.

Clinical Chemistry

Upon completion of this course, the student will be able to:

1) Meet the following accuracy requirements:

a) All procedures must be in control.
b) Results must be within 95% confidence limits of predetermined results (as available).

2) Perform the following procedures as requested with the accuracy requirements listed above:

a) Routine Chemistry

i) Creatinine/creatinine clearance
ii) Total protein
iii) Albumin
iv) A/G ratio
v) CSF protein
vi) Glucose
vii) BUN
viii) Other procedures, as ordered

b) Electrolytes and Blood Gases
i) Na and K
ii) Cl
iii) CO_2
iv) pH, pCO_2, and pO_2
v) Calculated blood gas parameters
vi) Osmolality
vii) Other procedures, as ordered

c) Special Chemistry
i) Protein electrophoresis
ii) LD and CK electrophoresis
iii) Other procedures, as ordered

3) State the normal range in appropriate units for the specimen(s) routinely analyzed by each method above.
4) State any variation in the normal range due to sex, age, diurnal variation, or other influences.
5) Classify results as normal or abnormal.
6) Evaluate results as possible critical values.
7) Correlate results with data from other departments for the same patient.
8) Validate results according to instructions in the procedure.

9) Explain how to standardize each procedure and perform the standardization procedures as assigned, including necessary calculations and preparation of graphs.
10) Dilute specimens as needed, and calculate the test results.

Hematology, Coagulation, Urinalysis

Upon completion of this course, the student will be able to:

1) Meet the following accuracy requirements:

   a) All procedures must be in control.
   b) Results must be within 95% confidence limits of predetermined results.

2) Perform the following procedures as requested within the accuracy requirements stated above:

   a) Hematology
      i) RBC, WBC, MCV, MCH, MCHC, Hct, Hgb, 3 part diff - Coulter S+ system or Cell-Dyn 3000
      ii) RBC, WBC, Hgb, and Hct- manual, as needed (Coulter Z)
      iii) Calculation of RBC indices
      iv) Differentials- WBC, platelet and RBC morphology
      v) Reticulocyte count
      vi) Sedimentation rate
      vii) Sickle cell prep.
      viii) Platelet count

   b) Coagulation (if applicable):
      i) Prothrombin time.
      ii) APTT.
      iii) Fibrinogen assay.

3) State the normal range in appropriate units for the specimen(s) routinely analyzed by each method above.
4) State any variation in the normal range due to sex, age, diurnal variation, or other influence.
5) Classify results as normal or abnormal.
6) State "critical values" when they exist.
7) Correlate results with data from other departments on the same patient, when appropriate.
8) Explain the chemical or physical principle of the procedures, including:

   a) The purpose of each reagent.
   b) The function of each step in the procedure.

9) Explain why each analysis above is performed by:

   a) Stating the origin of the analyte or cell
   b) Stating the function of the analyte or cell in the body.
   c) Listing examples of conditions that elevate or decrease the level of the analyte or cells in the body.

10) Identify the critical parameters of each procedure, such as:

   a) Timing
   b) Temperature
   c) pH
   d) Order of addition and mixing of reagents
   e) Special techniques

Blood Bank and Serology

Upon completion of this course, the student will be able to:

1) Meet the following accuracy requirements:

   a) All reagents and equipment must be documented to be performing properly.
   b) Results must be 100% accurate.

2) Perform the following procedures as requested with the accuracy requirements stated above:

   a) ABO grouping and Rh typing (including weak D and Rh phenotype, as appropriate).
   b) Other antigen typing.
   c) Direct antiglobulin test.
   d) Antibody screen.
   e) Antibody identification.
   f) Compatibility testing.
   g) Rho(D) immune globulin screening.
   h) Inventory maintenance.
   i) Other procedures, as ordered.
   j) Cord blood studies

3) Explain the chemical or physical principle of the procedures, including:

   a) The purpose of each reagent.
   b) The function of each step in the procedures.

4) Identify the critical parameters of the procedure, such as:

   a) Timing
   b) Temperature/pH
   c) Order of addition and mixing of reagents
   d) Special techniques
   e) Maintain donor inventory appropriate for a laboratory of this size.

5) Maintain accurate and complete records.

6) Follow established procedures for issue of blood for transfusion and the return of donor units to the blood bank.

7) Explain the purpose of procedures, and interpret results obtained.

8) Perform the following serology tests, as ordered:

   a) Slide tests (latex and RBC)
   b) Tube titrations
   c) ELISA/EIA tests
   d) Pregnancy tests.
   e) Neutralization tests

9) State normal results in appropriate units for specimens routinely analyzed in the serology tests listed above.

10) State any variation in the normal range due to sex, age, diurnal variation, or other influences.
11) Classify results as normal or abnormal, as appropriate.

12) State "critical values" when they exist.
13) Correlate results with data from other departments on the same patient.

14) Explain the chemical or physical principle of the procedures including:

a) The purpose of each reagent.
b) The function of each step in the procedure.

c) Correlate test results with clinical conditions.

d) Perform appropriate control for each assay.
15) Other duties assigned

Microbiology

Upon completion of this course, the student will be able to:

1) Meet the following accuracy requirements:
   a) All reagents and equipment are performing properly
   b) Results must be 100% accurate, including spelling of all organism names.

2) Perform the following Microbiology tests, if applicable:

3) Smears/mounts

   a) Gram stain
   b) Acid fast stains (Kinyoun or Auramine/Rhodamine)
   c) Acridine orange
   d) Trichrome stain
   e) KOH
   f) Lactophenol cotton blue

4) Cultures

   a) Throat
   b) Urine
   c) Genital tract (GC screen and vaginal culture)
   d) Sputum
   e) Aerobic and anaerobic wound specimens
   f) Cerebral spinal fluid
   g) Stools (Culture and susceptibility and O and P)
   h) Miscellaneous cultures (including ear, eye, nose, synovial fluid)
   i) Blood cultures
   j) Rapid strep screen

5) Differentiate between expected normal flora and pathogens in each type of culture listed above.

6) Recognize "critical values" when they exist.

7) State any microbial variations due to age, sex, or other influences.

8) Choose and implement the correct method for the presumptive and/or definitive identification of all clinically significant isolates from the cultures listed above, including automated and semi-automated methods.

9) Perform and correctly interpret results of susceptibility testing.

10) Perform routine quality control on:

a) media
b) reagents
c) smears
d) incubators

CLLS 291: Applied Clinical Practicum
Winter, 2005

I. **Course Information**

A. Meeting time: To be arranged with the clinical site. Refer to the CLS Programs attendance policy, at ***http://www.ferris.edu/cls/handbook/clinicalattend.html***.

B. Location: An affiliated clinical laboratory, as assigned.

C. Credit hours: 12

D. Course configuration: 0 + 40

E. ***Course description:*** Application of theories and basic techniques in immunohematology, clinical immunology, clinical chemistry, clinical microbiology, hematology, coagulation, and body fluid analysis in a clinical laboratory setting for 14 weeks.

F. Prerequisites: CLLS 256, or permission of instructor

II. **Instructor:** Barbara Ross MS, MT(ASCP)

A. Office: VFS 303

B. Office phone: 231.591.2317

C. E-mail: ***ROSSB@FERRIS.EDU***. For course related communications, please use the e-mail function within WebCT.

D. Office hours: 0900 – 1050 TR

III. **Required books:** None. Purchase and use of a review book for CLS certification examinations is highly recommended.

IV. **Course objectives:** Refer to CLLS 291 in your WebCT link.

V. Course goals: In keeping with the CLS program goals listed in the CLS Student Handbook, goals for this course are to provide you, the student with opportunities to:

A. Practice laboratory safety, applying your knowledge of blood borne pathogens, chemical hygiene, and laboratory safety policies.

B. Develop technical competence through guided practice in a laboratory setting.

C. Integrate theory and practice.

D. Evaluate the suitability of samples submitted for testing.

E. Perform tests, evaluate results, recognize unusual results and perform or recommend follow – up testing when indicated.

F. Apply quality assurance practices to the clinical laboratory.

Course Goals, continued:

G. Practice professional behaviors, including maintaining the confidentiality of patient results,

neatness in work habits, performing to the best of your abilities, following established program and laboratory policies, and assuming responsibility for your own learning.

H. Incorporate your clinical laboratory science, general education and other courses into daily practice in the clinical laboratory.

I. Be evaluated fairly based on your skills, knowledge, and performance.

J. Work as a member of a health care team, focusing on patient care.

K. Practice maintaining professional competence under the normally stressful conditions of the laboratory.

L. Be aware of the impact of external regulatory requirements, such as those of CLIA 88, OSHA, HIPAA, and NAACLS, and to comply with those requirements.

M. Correlate results from all areas of the laboratory and relate these results to the clinical condition of the patient.

VI. Instructional methods: Guided practice, under the supervision of designated clinical laboratory science professionals.

VII. Course requirements: Each student is expected to comply with the policies of the Clinical Laboratory Science programs, as well as the policies and procedures of the clinical site. Refer to Part IV of the Clinical Laboratory Sciences Student Handbook **at** http://www.ferris.edu/cls/handbook/clinicalexperience.html.

VIII. Grading and evaluation: Your grade for this course will be 60% based on your laboratory skills and 40% on exam scores. Go to the CLLS 491 homepage on WebCT.There you will find a clinical skills checklist for each laboratory section (as well as access to the exams). You can check your grade as you go along.

IX. Attendance requirements: You must follow the attendance policies of the clinical site, as well as those of the CLS programs. Refer to **http://www.ferris.edu/cls/handbook/clinicalattend.html.** The clinical coordinator at your designated site will provide a specific schedule of your rotations.

CLLS 355: Advanced Clinical Chemistry
Fall, 2005

I. General Course Information

A. **Meeting times and locations:**

1. **Class:** TR, 0800 – 0850, VFS 425
2. **Lab:** M 0900 – 1150 VFS 423

B. **Credit Hours:** 3
C. **Course Configuration:** 2 + 3
D. **Course Description:** An advanced course in clinical chemistry that builds on the knowledge of clinical chemistry in CLLS 215. It provides a higher level of theory, applications and interpretations of clinical chemistry and new technologies used in a clinical setting.
E. **Prerequisites:** CLLS 215 or equivalent.

II. Faculty and how to contact me:

Name	Barbara Ross
Credentials	MS, MT(ASCP)
Office	VFS 303
Phone	231.591.2317
E-mail	Rossb@Ferris.edu
Office Hours	and by appointment

If I'm not available during office hours, I'll post alternatives. If you can't come during my office hours, we'll find another alternative.

III. Required Textbooks (3)

A. Tietz, NW, Ashwood, ER, and Border, B. Tietz Fundamentals of Clinical Chemistry, **Fifth Edition**, WB Saunders, 2000. Barnes and Noble listed price: $75.

Why this book? It is THE clinical chemistry book, and has been for years. (Mr. Landis is old enough to have a first edition; Mrs. Ross has a second edition!) You used this in CLLS 215, you'll need it for CLLS 335, and you'll want to refer to it for CLLS 465, PLUS your clinical chemistry internship. BUY IT! KEEP IT! READ IT! There is lots of very useful information in it!

B. Doucette, Lorraine J. Mathematics for the Clinical laboratory, WB Saunders, 1997. Barnes and Noble listed price: $34 (new).

Why this book? Everybody who works in the clinical lab has to do "lab math" sometimes, and most people dread it. So it's a good idea to have a source of information to refer to when you need to make a solution or correct for a diluted sample. There's a chapter method assessment that is what we will use this semester.

C. Ross, Barbara. CLLS 355 Lab Manual.

Why this book? You need the procedures to function in lab.

IV. Course Goals and Objectives

A. **Goals:** In keeping with the CLS program goals, found in the CLS Student Handbook, goals for this course are to provide you with opportunities to:

1. Practice safe laboratory procedures, applying knowledge of blood borne pathogens and chemical hygiene.
2. Evaluate the suitability of samples submitted for testing.
3. Perform tests for analytes in serum, plasma, urine, and other body fluids, using a variety of instruments and techniques.
4. Perform and interpret quality control tests, and validate results before reporting.
5. Operate and perform routine maintenance on clinical chemistry instruments.
6. Correlate clinical chemistry test results to human physiology and disease processes, including correlation with results from other laboratory sections, and review and application of basic concepts of human metabolism and pathology.
7. Investigate, select, evaluate, and validate clinical chemistry methods and procedures.
8. Practice professional behaviors, including maintaining confidentiality of patient data, neatness in work habits, performing to the best of your abilities, following established program policies, and assuming responsibility for your own learning in this course.

B. Objectives: Specific course objectives are included later in this syllabus.

C. What will you learn?

Clinical chemistry is the busiest area of most clinical laboratories. It is also the most highly automated. Now that you know how to perform most routine clinical chemistry tests, we'll step back and investigate how medical technologists select, implement, and validate procedures.

D. What does this have to do with your future?

While many medical technologists spend most of their time performing bench testing, it's also part of the job to figure out WHICH tests to perform, how to combine them to facilitate diagnosis, and how to be sure the results are the best possible: most accurate, most precise, most timely, and most cost-effective.

V. Instructional methods

A. How will this be taught?

You'll work in teams sometimes. Sometimes, I'll lecture. Often, we'll discuss things. I assume that you are ready to think about things, and to make decisions and recommendations based on information you have gathered. Remember, this is Clinical Laboratory SCIENCE: we should be basing our decisions on information.

A tentative schedule is included later in this syllabus.

B. What about lab?

A lab schedule is included later in this syllabus.

V. Nature of the course, continued:

C. What do I have to do?

1. Come to class, pay attention, and participate.
2. Come to lab, do the work. Be sure your data get stored correctly; we're going to be basing some decisions on work done by all of you over several weeks, so we can't lose any!
3. Write up descriptions of various analytes and diseases, and contribute them to some review sheets that we will build as a team.
4. Investigate a clinical chemistry textbook, and see if Tietz is the best possible alternative. Present your conclusions to the class.

VI. Course Requirements

A. Written assignments

1. You'll look up tumor markers, hormones and some tests for them, analytes that can be used for nutritional assessment, a cardiac marker, and diseases of the kidney, liver, and heart. From the information that you provide, we'll build some review sheets that you can use on internship and when studying for certification.
2. Working in teams, you'll investigate a clinical chemistry textbook for future students. At the end of the course, your team will make a presentation with your recommendations.

B. Exams:

1. There will be four quizzes. Probably mostly multiple choice, with some calculation problems.
2. **Final exam:** The final exam will be cumulative. It too will be mostly multiple choice and short answer.

C. Labs: You must wear your lab coat, fastened, and your nametag. Bring a black marker and your calculator. Obey the safety rules.

VII. Resources, references, and supplies

A. **Web sites:** Some that you may want to try are:

1. www.AACC.ORG (the site of the American Association of Clinical Chemistry, which features case studies and a "Question of the Day," among other things) and
2. www.Westgard.com , which teaches you about QC rules.
3. www.LabCorp.com, which is a large independent laboratory. Under Directory of Services, you'll find a lot of valuable information about how to measure just about any analyte.
4. www.Aruplab.com, another large independent reference laboratory.
5. www.webmd.com, a good site for diseases and some lab tests.
6. http://www.labtestsonline.org/ which describes 100s of lab tests in plain English
7. Instrument manufacturers also have web sites, which you'll want to use when you're investigating analyzers.

B. **Other readings:** If (when) Tietz seems like too much to handle, there are other clinical chemistry books in the cupboard in VFS 423.

VIII. Resources, references, and supplies, continued:

C. **Required supplies:**

1. Lab coat
2. Name tag
3. Indelible marker
4. Calculator
5. Three ring binder. **Get a big one.** Put your lab manual in it.

VIII. Evaluation

A. What will be graded?

Labs	11 @ 10 = 110	20%
Number crunching assignment	20	3.6%
Book recommendation assignment	50	9.1%
Analyte/ Disease write-ups	7 @ 10 = 70	12.7%
Quizzes	4 @ 50 = 200	36.4%
Final Exam	100	18.2%
Total	550	100%

The standard grading system of the CLS programs will be used. See the CLS Student Handbook.

B. How will I be graded?

1. Lab reports and number crunching:

   a. Did you do the assigned tests?
   b. Did you include the required controls, calibrators, and standards?
   c. Did you record/ report things correctly (units, significant figures, graphs labeled?)
   d. Did you use the data we gathered to come to correct conclusions about errors, acceptability, and the need to adjust systems?

2. Analyte/Disease write-ups and review sheet

   a. Did you do the assignment, and hand it in on time?
   b. Is the information correct?
   c. Were you available to answer questions from your colleagues, if needed?
   d. Did you compile available information into a useful review sheet for students?

3. Textbook project

   a. Did you complete the assignment?
   b. Did you come to a conclusion about the text and how it would fit into the FSU/CLS lab?
   c. Did you present your conclusions to the class so that they can understand your decision?
   d. Did you work well as a team member?

4. Exams

a. Did you answer the questions correctly?
b. Did you work independently?

C. Level of comprehension expected:

There will be MUCH LESS material to memorize than in CLLS 215. You must be able to APPLY your knowledge to specific situations. When we cover organ systems, I may give you test results and ask if they are within the reference ranges for those analytes, or if they are consistent with certain disease states. I will expect you to look at a list of results and pick out the ones that may be abnormal or inconsistent. This is the kind of knowledge you will use on the job.

For the really big picture, you'll need to think about what the lab needs to get the work done, look up some alternatives, and make some decisions and recommendations. This will require that you have some knowledge of our resources and our systems. But you've been here for a while, so that shouldn't be a problem.

IX. Attendance

A. College Attendance Policy: The faculty of CAHS adopted the following attendance policy on February 12, 2002:

Class attendance in the College of Allied Health Sciences is a privilege and is expected. The right to attend class is gained through programmatic admission after successful completion of a selective admissions process. Through attendance, students acquire knowledge and skills related to profession-specific procedures, are introduced and socialized into the professional environment in which they will function, and develop into individuals who understand and model the professional behaviors that will be expected of them in the workplace. Because of the complex and critical nature of professional education provided by the faculty of the College, students are not at liberty to choose whether to attend class meetings. In the event a student is unable to attend a lecture, laboratory, or clinical experience, the student is expected to notify the instructor (the clinical instructor should also be notified in clinical courses) in as timely a fashion as possible as specified by the instructor. At the next scheduled class meeting, the student is expected to provide written documentation of the reason for the absence. If the student does not provide adequate documentation in a timely manner, the instructor reserves the right to apply the appropriate actions. These actions can range from receiving no grade for missed assignments to stopping the progression of a student through the program. The actions applied will be class specific and applied equitably and diligently by the instructor to all enrolled in the course. The actions imposed will also be consistent with the respective programmatic attendance policies that will be included in the course syllabi and reviewed at the beginning of the course.

B. Mrs. Ross's Attendance Policy:

1. **I will take attendance in this course.** You're learning techniques to use on the job in the contemporary transfusion service. When you leave Ferris for clinical experience, the instructors will expect that you have learned these procedures, and the theory behind them. Therefore, I expect you to attend every class. Think of this as your job. If you must be absent, as with a job, telephone IN ADVANCE (231-591-2317) and leave a message. If you don't, I will assume that you are absent due to lack of interest, and are also not interested in making up the quiz or lab. It is time to be serious about your work.
2. **Acceptable excuses include:** illness, weather emergency, death in the family, required court appearances, and trips made by you as a varsity athlete.
3. **If you miss class with an excuse reported ahead of time:** See me. We'll figure out a way for you to learn the content that you missed. If you missed lab, we'll have to schedule a time for you to make it up.

4. **If you missed class without an excuse:** You're on your own for the content. If you missed a lab or an exam, you're out of luck. You also get a zero for the points assigned.

C. Mrs. Ross's Tardiness Policy:

Class begins at 0800, and labs begin at the specified hours. I expect to see you present, with materials available, and ready to go. If you're not, expect to lose points for any assignment that you began late.

XI. Guidelines for student conduct

A. Come on time and be ready to start.
B. Wear your lab coat, shoes with closed toes and heels, and your nametag. If you want to wear sandals and shorts, stuff an old pair of jeans and some socks and sneakers in a locker to wear to lab.
C. Bring your calculator EVERY TIME. Forgetting it doesn't mean you don't have to calculate, it means YOU HAVE TO CALCULATE WITHOUT IT.
D. Clean up after yourself.
E. Cooperate.
F. Have fun, and learn all you can.

XII. Other General Course Policies

A. ADA: A copy of the services provided by the university is found in the CLS Student Handbook. Refer to: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/adaaccomodations.html

B. Harassment: The University expects its employees and its students to treat each other with respect and civility. For the policies, refer to: http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/employeedignity.htm and http://www.ferris.edu/htmls/administration/president/generalcounsel/AffirmativeAction/studentdignity.htm.

C. Religious Holidays: refer to http://www.ferris.edu/HTMLS/administration/academicaffairs/vpoffice/policyLetters/religHol.htm for a copy of this policy.

D. Disruptive Student Policy: Refer to the CLS Student Handbook: http://www.ferris.edu/HTMLS/academics/course.offerings/clinlabs/handbook/disruptivebehavior.html

CLLS 355: Clinical Chemistry 2
Fall, 2005
Tentative Class Schedule

Date	Class	Reading
	The Big Picture: Method Evaluation	
T 0830	Introduction; Meet the syllabus	
R 0901	Reference Ranges	Tietz, chapter 14
T 0906	Reference Ranges	---
R 0908	Predictive Value Testing	Tietz, pp. 260 – 261 Doucette, pp. 311 – 315
T 0913	Predictive Value Testing	---
R 0915	Predictive Value Testing	---
T 0920	**Quiz**	---
R 0922	Introduction to Method Evaluation	Tietz, chapter 13 Doucette, pp. 315 – 332
T 0927	Linearity/Range of Reportable Results Within Run Replication	---
R 0929	Recovery of Analyte	---
T 1004	Interference Studies	---
R 1006	Comparison of Methods	---
T 1011	Comparison of Methods	---
R 1013	Comparison of Methods	---
T 1018	**Quiz**	---
	The Medium Picture: Organ Systems Testing	
R 1020	Kidney Function Testing; **Kidney Disease Assignment due**	Tietz, chapter 34
T 1025	Kidney Function Testing	---
R 1027	Liver Function Testing; **Liver Disease Assignment due**	Tietz, chapter 36
T 1101	Liver Function Testing	---
R 1103	Cardiac Function Testing; **Cardiac Marker Assignment due**	Tietz, chapter 33
T 1108	Cardiac Function Testing	---
R 1110	**Quiz**	---
	The Little Picture: More Analytes	
T 1115	Hormone Testing; **Thyroid Hormone Assignment Due**	Tietz, chapter 39 (Review chapter 40)
R 1117	Hormone Testing	Tietz, chapter 41
T 1122	Hormone Testing; **Non – Thyroid Hormone Assignment Due**	Tietz, chapter 42
R 1124	**Thanksgiving Break**	**NO CLASS**
T 1129	Nutritional Assessment **Nutritional Analyte due**	Tietz, chapter 45
R 1201	Tumor Markers **Tumor Marker Assignment Due**	Tietz, chapter 21
T 1206	Tumor Markers	---
R 1208	**Quiz**	---

M. Correlate results from all areas of the laboratory and relate these results to the clinical condition of the patient.

Instructional Methods

: Instructional methods: Guided practice, under the supervision of designated clinical laboratory science professionals.

Course Requirements

Requirements: Each student is expected to comply with the policies of the Clinical Laboratory Science programs, as well as the policies and procedures of the clinical site. Refer to Part IV of the Clinical Laboratory Sciences Student Handbook at http://www.ferris.edu/cls/handbook/clinicalexperience.html.

Grading and Evaluation

: Your grade for this course will be 60% based on your laboratory skills and 40% on exam scores. Go to the CLLS 491 homepage on WebCT: http://webct.ferris.edu/SCRIPT/CLLS491_DD/scripts/serve_home. There you will find a clinical skills checklist for each laboratory section (as well as access to the exams). You can check your grade as you go along

Attendance Requirements

: You must follow the attendance policies of the clinical site, as well as those of the CLS programs. Refer to http://www.ferris.edu/cls/handbook/clinicalattend.html. The clinical coordinator at your designated site will provide a specific schedule of your rotations

CLLS 494: Management Practice in Clinical Laboratory Science
Winter, 2005

Instructor: Ross **Credit Hours:** 1

Office: VFS 303 **Course configuration:** 0+40

Class hours: to be arranged

Office hours: TR 0900 - 1050

Course Description: A problem solving management project for baccalaureate degree interns. Each student will identify a problem or project, write a proposal, modify the proposal as needed, obtain approval, carry out the assigned project, and write a paper describing the project, its results, and recommendations for future action.

Prerequisite: CLLS 465

Textbook: none

Instructional methods: written assignments, research, other, as assigned.

Evaluation:

Identify project	10 points
Write proposal and timeline	20 points
Gain approvals	10 points
Provide interim reports 2 @ 10 points	20 points
Written final report	40 points
Total	**100 points**

The standard grading scale of the CLS programs will be used.

Notes:

1. If you have a disability that would make it difficult to complete the objectives of this course, see an instructor STAT. We'll see what can be done to help.
2. Maintaining communication with your assigned supervisor and on-campus instructor is an important part of this course. Since most of the work of the course will be done at the clinical site, monitoring and assistance is more difficult. If you need help, telephone to 231.591.2317. The voice mail system records the date and time of your call. Another good route is e-mail. Send messages to ROSSB@FERRIS.EDU. I'll respond!
3. I'll be as cooperative as possible. However, it's up to you to keep yourself on track. One of the easiest things to monitor is if you are keeping to your time line!

Proposed timeline

Date	Tasks
Week of 011005	Contact laboratory and meet with manager or assigned supervisor; Identify project; write proposal
012105	Submit one copy of proposal to supervisor and one to Mrs. Ross
Week of 012405	Mrs. Ross and supervisor evaluate proposal; student revises proposal as needed
012805	Gain approval for proposal WITH SIGNATURES
	Order supplies as needed
	Carry out project, gather data, reach conclusions, write report
022505	Interim report #1 due, 1700
032505	Interim report #2 due, 1700
042905	Submit written report to supervisor and Mrs. Ross by 1700

Ideas:

1. Take charge of National Medical Laboratory Week for your lab for 2005. Plan events, get gifts, publicize, and write a report with recommendations for whoever does this next year.
2. Do all or part of the validation of a new piece of laboratory equipment, such as a refrigerator or a set of pipettes.
3. Work on method evaluation for a new analyzer.
4. Design, implement and evaluate technical competency in one laboratory section.
5. Prepare and deliver a continuing education presentation for laboratory staff. This must involve your own research and your own words. Finding and showing a videotape doesn't count.
6. Investigate bringing an analyte in-house (something now sent ot a reference lab) or implementing a new analyte, including validation and cost per test.
7. Participate on a QA team for a specific project.
8. Whatever needs to be done!

CLLS 499: Clinical Laboratory Sciences Seminar
Fall, 2004

Instructor: deRegnier

Credit Hours: 1

Office: VFS 408

Course Configuration: 1+0

Class Hours: W, 11-11:50

Classroom: VFS 325

Office Hours: M: 15:00-17:00
T, W, R: 09:00-10:00
Others by appointment.

Course Description: A course addressing students' comprehension of clinical laboratory science and general education concepts, which will be accomplished through written assignments, projects, and examinations.

Prerequisite: Enrollment in final on-campus semester of program.

Textbook: None

Instructional Methods: Discussion, self-assessment, written assignments.

Evaluation:

Attendance and Participation	100
Mission/Vision Statements	50
Skills Inventory	100
Certification Exam Review Plan	100
Project for presentation	150
Total	**500**

The standard grading scale of the CLS programs will be used.

Notes:

1. If you have a disability that would make it difficult to complete the objectives of this course, see an instructor STAT. We'll see what can be done to help.
2. Attendance will be taken in this course. Since most of the work of the course will be done in class, failure to attend automatically means that you're not doing the required work. If you absolutely CANNOT come to class, telephone IN ADVANCE to 591-2327. The voice mail system records the date and time of your call. ***For each three unexcused absences and your grade will drop one full letter grade***. The following are considered ***excused*** absences:

    - University sponsored events in which an excused absence form from the University is presented to me.
    - Death in the family.
    - Extended hospitalization. Appropriate verification will be needed. This does not include emergency room or doctor appointments.
    - Being called to testify in court, not for being arrested.
    - Dangerous weather conditions in which driving is considered by local police to be unsafe. This applies to commuter students only
3. If you need to find me, the best route is e-mail. Send messages to deregnid@Ferris.Edu I'll respond!

GENERAL POLICIES:

Student Dignity

The University expects all students and employees to conduct themselves with dignity and respect for students, employees, and others. It is each individual's responsibility to behave in a civil manner and make responsible choices about the manner in which they conduct themselves. Harassment of any kind is ***not acceptable*** at Ferris State University. The University does not condone or allow harassment of others whether engaged in by students, employees, supervisors, administrators, or by vendors or others doing business with the University.

Harassment is the creation of a hostile or intimidating environment in which verbal or physical conduct, because of its severity or persistence, is likely to significantly interfere with an individual's work or education, or adversely affect a person's living conditions.

To assist with the understanding of what harassment is, this policy contains specific definitions of two of the more prevalent types of harassment – racial harassment and sexual harassment.

Harassment

Racial harassment includes any conduct, physical or verbal, that victimizes or stigmatizes an individual on the basis of race, ethnicity, ancestry, or national origin. Such behavior could involve
verbal conduct, intentional or otherwise, that has the purpose or effect of (or explicitly or implicitly threatens to) interference with an individual's personal safety, academic efforts, employment, or participation in University-sponsored activities.

The attributes of racial harassment described above are also the attributes of most other types of harassment that can occur. Harassment may be based upon a person's status that is protected by law (i.e., religion, veteran status, handicap, etc.), or may be for some other reason not specifically covered by law. In any event, harassment of any type is ***not acceptable*** at Ferris State University.

Sexual Harassment

Using the definition contained in the Equal Employment Opportunity Commission guidelines, adapted to include educational environments, sexual harassment is defined as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) submission to such conduct is made either explicitly or implicitly term or condition of an individual's employment or academic advancement;
2) submission to or rejection of such conduct by an individual is used as a factor in employment or academic decisions affecting such individuals;
3) such conduct has the purpose or effect of substantially interfering with an individual's work or academic performance, or creating an intimidating, hostile, or offensive working, living, or academic environment.

While sexual harassment most often takes place in situations of power differential between the persons involved, sexual harassment may also occur between persons of the same status, e.g., student-to-student. The person exhibiting sexually harassing conduct

need not realize or intend the conduct to be offensive for the conduct to constitute sexual harassment.

Harassment Concerns

Any person who believes he or she has been subjected to harassment of any kind (sexual, racial, or otherwise) should approach the individual whom they believe is responsible. He or she should identify the specific behavior, explain that he or she considers the behavior to be offensive and/or harassing, and ask the individual to stop the behavior. If assistance is needed to approach the individual, contact either an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, or the Director of Affirmative Action.

If approaching the individual is not possible (i.e., you are uncomfortable or uncertain as to how the situation should be handled or concerned the situation may become volatile) or does not resolve the matter, it should then be reported immediately to an Academic Dean, the Dean of Students, the Director of Minority Student Affairs, the Director of Student Judicial Services, or the Director of Affirmative Action. If, for some reason, you are uncomfortable discussing your situation with any of these individuals, please report your situation to any member of University administration. The circumstances surrounding the matter will be fully investigated, including the nature of the harassment and the context in which it occurred.

All reports of harassment and subsequent investigations will be kept as confidential as possible. Anyone found to have violated this Policy will be subject to discipline up to and including discharge and dismissal that may include, but not be limited to, official reprimand, official apology, sensitivity training, and/or other disciplinary action including dismissal. Likewise, because intentionally false accusations of harassment can have serious effects on innocent people, anyone found to have intentionally falsely accused another person of violating this Policy will be subject to discipline up to and including discharge or dismissal.

Disruptive Behavior Policy Statement

The College of Allied Health Sciences strives to maintain a positive learning environment and educational opportunity for all students. Consequently, patterns of behavior which obstruct or disrupt the learning environment of the classroom or other educational facilities will be addressed.

1. The instructor is in charge of the course. This includes assignments, due dates, methods and standards of grading, and policies regarding attendance, tardiness, late assignments, outside conferences, etc.
2. The instructor is in charge of the classroom. This includes the times and extent to which they allow questions or discussion, the level of respect with which they and other students are to be treated, and the specific behaviors they will allow within their classes. Open discussion of an honest opinion about the subject of a course is encouraged, but the manner in which the class is conducted is a decision of the instructor.
3. If a student persists in a pattern of recurrent disruptive behavior, then the student may be subject to administrative action up to and including an involuntary withdrawal from the course, following administrative review by the Allied Health Sciences Dean's Office, and/or University disciplinary proceedings.
4. Disruptive behavior cannot be sanctioned by a lowered course grade (e.g., from a B to a C) except insofar as quality of classroom participation has been incorporated into the instructor's grading policy

for all students. (Note: Academic misconduct, which is covered by other regulations, can be a legitimate basis for lowering a grade or failing the student.)

6. Students as well as employees are bound by the University's policy against harassment in any form. Harassment will not be tolerated.
7. The office of the student's dean will be notified of any serious pattern or instance of disruptive behavior.

Honesty Policy

The purposes of this policy are to encourage a mature attitude toward learning to establish a sound academic morale, and to discourage illegitimate aid in examinations, laboratory, and homework.

Cheating is defined as using or attempting to use, giving or attempting to give, obtaining or attempting to attain, products or prepared materials, information relative to a quiz or examination or other work that a student is expected to do alone and not in collaboration with others. Plagiarism (copying) of themes or other written work shall also be considered an infraction.

Students are required to present the results of their own work except under circumstances in which the instructor may have requested or approved the joint effort of a number of students.

The penalty for the first offense of willful cheating consists of the student receiving a zero for the assignment in which the infraction occurs. However, cheating on quizzes or examinations means failure in the course. The student may appeal the decision to the Disciplinary Committee.

Further offenses may result in suspension or dismissal from the University.

CLLS 499: Clinical Laboratory Sciences Seminar
Fall, 2004
Tentative Schedule

Date	Activity	Assignment Due Today
09/01	Introduction: getting organized Helping you succeed	Skills gap inventory
09/08	Using WebCT for the Mock Exam	Skills gap inventory summary
09/15	Studying for the Certification exam	Take exam Sept 11
09/22	Study plan for Certification exam	Mission/Vision Statement
09/29	What is my mission and vision?	Exam Questions
10/6	Improving a skill	TBA
10/13	Improving a skill	TBA
10/20	Planning and Creating a presentation	TBA
10/27	Planning and Creating a presentation	TBA
11/3	Planning and Creating a presentation	TBA
11/10	Planning and Creating a presentation	TBA
11/17	Planning and Creating a presentation	TBA
11/24	Planning and Creating a presentation	Presentation
12/1	Professional organizations; why join?	TBA
12/8	Discuss study plans	Certification exam study plan due

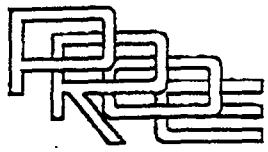
Whatever skills are in the most need of improvement are the ones we will discuss. For each skill, you will be asked to write a short-term goal, a medium term goal, and a long-term goal. There will be a handout associated with each skill, and have group discussions.

Course Objectives

Upon completion of this course, the student will be able to:

1. Recognize that her/she is in charge of his/her own future, and prepare to manage that future.
2. Prepare a plan to review and practice for external certification exams.
3. Write short-term, medium-term, and long-term goals to maintain or enhance professional and life skills.
4. Plan and create a presentation for entry into MSCLS poster competition
5. List several professional organizations related to Clinical Laboratory Science and recognize the importance of membership.

Appendix D: Survey Instruments



Master

COLLEGE CAHS

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

INSTRUCTIONS TO RESPONDENTS

On the following pages you are asked to give your perceptions of your occupational program (such as registered nursing, automotive technology, secretarial science). The items you are asked to rate are grouped into the major components of the Program Review in Occupational Education (PROE) system, namely:

- Goals and Objectives
- Processes
- Resources

Rate each item by checking your best judgment on a five point scale ranging from poor to excellent. Only check one answer per item. A "Don't Know" column has been provided in the event you really don't have sufficient information to rate an item. Space has been provided for you to note comments that may help to clarify your ratings or to indicate modifications of a standard to make it more relevant for your program.

Criteria for excellent and poor ratings are provided for each item. *Excellent* represents a nearly ideal or exemplary situation; *poor*, one of serious inadequacy. As a guide, ratings may be made with the following in mind:

EXCELLENT means ideal, top 5 to 10%
GOOD is a strong rating, top 1/3rd
ACCEPTABLE is average, the middle 1/3rd
BELOW EXPECTATIONS is only fair, bottom 1/3rd
POOR is seriously inadequate, bottom 5 to 10%

This form may be completed as a *consensus* evaluation by the principal persons involved with a specific occupational program. Examples of such persons would be instructors, department or division chairpersons, program coordinators, and administrators such as occupational dean. If preferred, respondents may complete individual forms.

To help with tabulation of responses, please provide the information requested below before completing your rating.

PROGRAM TITLE CLLS USOE CODE #__ __.__ __ __ __ __ __

PERSONS PARTICIPATING IN CONSENSUS EVALUATION OR INDIVIDUAL COMPLETING THIS FORM:

Name	Title

Thanks for your cooperation!

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

		Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
GOALS AND OBJECTIVES									
1. Participation in Development of College Occupational Education Program Plan *Excellent*—Administrators and/or other supervisory personnel involved in developing and revising the college plan for this occupational program seek and respond to faculty, student and community input. *Poor*—Development of the plan for this program is basically the work of one or two persons in the college.	1						X X X		opportunity for input
2. Program Goals *Excellent*—Written goals for this program state realistic outcomes (such as planned enrollments, completions, placements) and are used as one measure of program effectiveness. *Poor*—No written goals exist for this program.	2					X X	X		Written goals are realistic. Deans goals are constantly changing & not always attainable
3. Course Objectives *Excellent*—Written measurable objectives have been developed for all occupational courses in this program and are used to plan and organize instruction. *Poor*—No written objectives have been developed for courses in this program.	3					X	X X		
4. Competency Based Performance Objectives *Excellent*—Competency based performance objectives are on file in writing, consistent with employment standards, and tell students what to expect and help faculty pace instruction. *Poor*—Competency based performance objectives have not been developed for courses in this program.	4					X X	X		need minor revision to conform with revised Curriculum & prepare for accred.
5. Use of Competency Based Performance Objectives *Excellent*—Competency based performance objectives are distributed to students and used to assess student progress. *Poor*—Competency based performance objectives are not used with students for progress evaluation nor are students aware that they exist.	5						X X X		
6. Use of Information on Labor Market Needs *Excellent*—Current data on labor market needs and emerging trends in job openings are systematically used in developing and evaluating this program. *Poor*—Labor market data is not used in planning or evaluation.	6					X	X X		
7. Use of Information on Job Performance Requirements *Excellent*—Current data on job performance requirements and trends are systematically used in developing and evaluating this program and content of its courses. *Poor*—Job performance requirements information has not been collected for use in planning and evaluating.	7					X	X		good communication with labs in Med. Keeps us up to date

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

	Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
GOALS AND OBJECTIVES (Continued)								
8. Use of Profession/Industry Standards *Excellent*—Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses. *Poor*—Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.	8					X X X		
9. Use of Student Follow-Up Information *Excellent*—Current follow-up data on completers and leavers (students with marketable skills) are consistently and systematically used in evaluating this program. *Poor*—Student follow-up information has not been collected for use in evaluating this program.	9				X X	 X		When info is available Better at following completers than leavers
PROCESSES								
10. Adaptation of Instruction *Excellent*—Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as small group or individualized instruction, laboratory or "hands on" experiences, open entry/open exit, credit by examination). *Poor*—Instructional approaches in this program do not consider individual student differences.	10				X	X X		We do this very well We use some of the listed method
11. Relevance of Supportive Courses *Excellent*—Applicable supportive courses (such as anatomy and physiology, technical communications, technical mathematics) are closely coordinated with this program and are kept relevant to program goals and current to the needs of students. *Poor*—Supportive course content reflects no planned approach to meeting needs of students in this program.	11			X		X	X	Scheduling courses is difficult ie. Chem 124 only winter
12. Coordination with Other Community Agencies and Educational Programs. *Excellent*—Effective liaison is maintained with other programs and educational agencies and institutions (such as high schools, other community colleges, four year colleges, area vocational schools, proprietary schools, CETA) to assure a coordinated approach and to avoid duplication in meeting occupational needs of the area or community. *Poor*—College activities reflect a disinterest in coordination with other programs and agencies having impact on this program.	12				X	X	X	Improving
13. Provision for Work Experience, Cooperative Education or Clinical Experience. *Excellent*—Ample opportunities are provided for related work experience, cooperative education, or clinical experience for students in this program. Student participation is well coordinated with classroom instruction and employer supervision. *Poor*—Few opportunities are provided in this program for related work experience, cooperative education, or clinical experience where such participation is feasible.	13					X	X X	

PROE

1

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
PROCESSES (Continued)							
14. Program Availability and Accessibility — *Excellent*—Students and potential students desiring enrollment in this program are identified through recruitment activities, treated equally in enrollment selection, and not discouraged by unrealistic prerequisites. The program is readily available and accessible at convenient times and locations. *Poor*—This program is not available or accessible to most students seeking enrollment. Discriminatory selection procedures are practiced.	14			X	X X		
15. Provision for the Disadvantaged — *Excellent*—Support services are provided for disadvantaged (such as socioeconomic, cultural, linguistic, academic) students enrolled in this program. Services are coordinated with occupational instruction and results are assessed continuously. *Poor*—No support services are provided for disadvantaged students enrolled in this program.	15			X X		X	Student/faculty contact appropriate Office Great FSU resources
16. Provision for the Handicapped. — *Excellent*—Support services are provided for handicapped (physical, mental, emotional, and other health impairing handicaps) students enrolled in this program. Facilities and equipment adaptations are made as needed. Services and facilities modifications are coordinated with occupational instruction and results are assessed continuously. *Poor*—No support services or facilities and equipment modifications are available for handicapped students enrolled in this program.	16		X	X X			↓ Need more counselors for students needing emotional support
17. Efforts to Achieve Sex Equity — *Excellent*—Emphasis is given to eliminating sex bias and sex stereotyping in this program: staffing, student recruitment, program advisement, and career counseling; access to and acceptance in programs; selection of curricular materials; instruction; job development and placement. *Poor*—Almost no attention is directed toward achieving sex equity in this program.	17				X X	X	
18. Provision for Program Advisement — *Excellent*—Instructors or other qualified personnel advise students (day, evening, weekend) on program and course selection. Registration procedures facilitate course selection and sequencing. *Poor*—Instructors make no provision for advising students on course and program selection.	18				X X X		I think we do an exceptional job
19. Provision for Career Planning and Guidance — *Excellent*—Day, evening, and weekend students in this program have ready access to career planning and guidance services. *Poor*—Little or no provision is made for career planning and guidance services for students enrolled in this program.	19			X	X X		Between advising & Career Services this is well covered

PROE

1

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

		Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
PROCESSES (Continued)									
20. Adequacy of Career Planning and Guidance *Excellent*—Instructors or other qualified personnel providing career planning and guidance services have current and relevant occupational knowledge and use a variety of resources (such as printed materials, audiovisuals, job observation) to meet individual student career objectives. *Poor*—Career planning and guidance services are ineffective and staffed with personnel who have little occupational knowledge.	20					4	X	X X	Not sure what Career services has. We do a good job Not sure of level of knowledge in the career plan office
21. Provision for Employability Information. *Excellent*—This program includes information which is valuable to students as employees (on such topics as employment opportunities and future potential, starting salary, benefits, responsibilities and rights). *Poor*—Almost no emphasis is placed on providing information important to students as employees.	21					4	X X X		Tell students of job openings More info provided than students are willing to use
22. Placement Effectiveness for Students in this Program *Excellent*—The college has an effectively functioning system for locating jobs and coordinating placement for students in this program. *Poor*—The college has no system or an ineffective system for locating jobs and coordinating placement for occupational students enrolled in this program.	22					X	X X		~~Student to faculty contact appropriate office~~ Students usually find own job More jobs than grads
23. Student Follow-up System *Excellent*—Success and failure of program leavers and completers are assessed through periodic follow-up studies. Information learned is made available to instructors, students, advisory committee members and others concerned (such as counselors) and is used to modify this program. *Poor*—No effort is made to follow up former students of this program.	23			X	3 X	4			area for improvement not as good w/ leavers
24. Promotion of this Occupational Program *Excellent*—An active and organized effort is made to inform the public and its representatives (such as news media, legislators, board, business community) of the importance of providing effective and comprehensive occupational education and specific training for this occupation to gain community support. *Poor*—There is no organized public information effort for this program.	24			X		X	X	3	Recruiter has done great job Appears to be improving A fair few people know & understand We could improve here
RESOURCES									
25. Provision for Leadership and Coordination *Excellent*—Responsibility, authority, and accountability for this program are clearly identified and assigned. Administrative effectiveness is achieved in planning, managing, and evaluating this program. *Poor*—There are no clearly defined lines of responsibility, authority, and accountability for this program.	25						X X X		New initiatives require more release time than program maintenance

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

		Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
RESOURCES (Continued)									
26. Qualifications of Administrators and/or Supervisors *Excellent*—All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability. They are knowledgeable in and committed to occupational education. *Poor*—Persons responsible for directing and coordinating this program have little administrative training, education, and experience.	26					X	X X		Seems we finally have a D.H. who knows what they're doing DH is supportive & a great old man.
27. Instructional Staffing *Excellent*—Instructional staffing for this program is sufficient to permit optimum program effectiveness (such as through enabling instructors to meet individual student needs, providing liaison with advisory committees, and assisting with placement and follow-up activities). *Poor*—Staffing is inadequate to meet the needs of this program effectively.	27			X X	X				It's hard to replace content experts who have left Tenix A lot of specialized info for a 7 I. for Do not have an expert in all areas will be a problem
28. Qualifications of Instructional Staff *Excellent*—Instructors in this program have two or more years in relevant employment experience, have kept current in their field, and have developed and maintained a high level of teaching competence. *Poor*—Few instructors in this program have relevant employment experience or current competence in their field.	28						X X X		The faculty who remain do an outstanding job Excellent
29. Professional Development Opportunities *Excellent*—The college encourages and supports the continuing professional development of faculty through such opportunities as conference attendance, curriculum development, work experience. *Poor*—The college does not encourage or support professional development of faculty.	29					X X	X		Funding not increasing as costs go up
30. Use of Instructional Support Staff *Excellent*—Paraprofessionals (such as aides, laboratory assistants) are used when appropriate to provide classroom help to students and to ensure maximum effectiveness of instructors in the program. *Poor*—Little use is made of instructional support staff in this program.	30						X X X		
31. Use of Clerical Support Staff *Excellent*—Office and clerical assistance is available to instructors in this program and used to ensure maximum effectiveness of instructors. *Poor*—Little or no office and clerical assistance is available to instructors; ineffective use is made of clerical support staff.	31					X	X X		They do a great job
32. Adequacy and Availability of Instructional Equipment. *Excellent*—Equipment used on or off campus for this program is current, representative of that used on jobs for which students are being trained, and in sufficient supply to meet the needs of students. *Poor*—Equipment for this program is outmoded and in insufficient quantity to support quality instruction.	32					X	X X		With increasing #'s of members of students the amount of available equipment & supplies may not be adequate without extra funding to purchase more Excellent equipment

PROE

1

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

		Keypunch Instructions	Poor 1	Below Expectations 2	Acceptable 3	Good 4	Excellent 5	Don't Know	COMMENTS (Please note explanatory remarks or needs for improvement)
RESOURCES (Continued)									
33. Maintenance and Safety of Instructional Equipment *Excellent*—Equipment used for this program is operational, safe, and well maintained. *Poor*—Equipment used for this program is often not operable and is unsafe.	33				X X	X			instrument preventa maintenance contract would help maintain equip.; keep it operational; help avoid costly repair We need periodic service
34. Adequacy of Instructional Facilities *Excellent*—Instructional facilities (excluding equipment) meet the program objectives and student needs, are functional and provide maximum flexibility and safe working conditions. *Poor*—Facilities for this program generally are restrictive, disfunctional, or overcrowded.	34					X X X			A couple of the classrooms need to be updated haven't been painted in 5 years. Need maintenance
35. Scheduling of Instructional Facilities *Excellent*—Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction. *Poor*—Facilities and equipment for this program are significantly under- or over-scheduled.	35					X X	X		
36. Adequacy and Availability of Instructional Materials and Supplies *Excellent*—Instructional materials and supplies are readily available and in sufficient quantity to support quality instruction. *Poor*—Materials and supplies in this program are limited in amount, generally outdated, and lack relevance to program and student needs.	36					X	X X		See # 32 Donations allow us to have a manageable budget Future is ? due to State budget Excellent though we worry about continued support
37. Adequacy and Availability of Learning Resources *Excellent*—Learning resources for this program are available and accessible to students, current and relevant to the occupation, and selected to avoid sex bias and stereotyping. *Poor*—Learning resources for this program are outdated, limited in quantity, and lack relevance to the occupation.	37					X	X X		
38. Use of Advisory Committees *Excellent*—The advisory committee for this program is active and representative of the occupation. *Poor*—The advisory committee for this program is not representative of the occupation and rarely meets.	38				X X		X		meetings are held consistently The most CLS they shy persons
39. Provisions in Current Operating Budget *Excellent*—Adequate funds are allocated in the college operating budget to support achievement of approved program objectives. Allocations are planned to consider instructor budget input. *Poor*—Funds provided are seriously inadequate in relation to approved objectives for this program.	39					X X	X		Worry about continuing support
40. Provisions in Capital Outlay Budget for Equipment *Excellent*—Funds are allocated in a planned effort to provide for needed new equipment and for equipment replacement and repair, consistent with the objectives for this program and based on instructor input. *Poor*—Equipment needs in this program are almost totally unmet in the capital outlay budget.	40				X	X X			more funding for maintenance of large lab equipment We have plans; funding is uneven.

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

Please answer the following: (Use back of page and extra sheets if necessary).

1. What are the chief occupational education strengths of your program?

- Well equipped laboratories:
  We are able to provide the students with practical experience while they're in a classroom setting. Some of the equipment in the student labs is the same (or a previous generation) as the types of analyzers seen in a clinical setting.
- Simulated laboratory:
  Simlab provides students with an opportunity to practice working as a tech before going out to their clinical internship. They learn the behaviors they will need to exhibit on their internship, including a management opportunity for the MT students.
- Knowledgeable faculty:
  The 2 full time faculty are great instructors and provide the students with a relevant classroom experience.

2. What are the major needs for improvement in your program and what action is required to achieve these improvements?

- Qualified adjunct instructors:
  For teaching specialized courses, it can be difficult to find someone qualified to teach courses as an adjunct instructor. This may be due, in part, to the FSU pay scale for the time commitment and potential commute involved.
- We are currently busy w/ 2 FT faculty + 1 FT lab assistant. It could be difficult to provide quality instruction if class numbers continue to increase (which is good) but we are lacking 2 FT faculty that were available when class sizes were previously at the anticipated level.
- The ability to find federally-funded work study students is becoming very difficult. It may be necessary in the future to look at budgeting a small amount for student help to ensure we have motivated, capable employees for some of the basic lab tasks.

PLEASE IDENTIFY THE POSITION OF THE PERSON COMPLETING THIS FORM AND THE OCCUPATIONAL PROGRAM (such as registered nursing, data processing).

Check One:

Division/Department Chair ____
Faculty ____
Counselor ____
Other, please specify: ✓ lab coordinator

Program: CLS

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

Please answer the following: (Use back of page and extra sheets if necessary).

1. What are the chief occupational education strengths of your program?

- Well trained, knowledgable, dedicated faculty + staff -
- up to date curriculum
- well-equipped laboratories, including lab information system.
- support from alumni, e.g. equipment donations
-

2. What are the major needs for improvement in your program and what action is required to achieve these improvements?

① loss of content experts from the faculty -
- hire qualified faculty member

② ongoing maintenance of lab equipment, including lab information system
- purchase maintenance agreements

③ recruit more students
- Continue the position of college recruiter

PLEASE IDENTIFY THE POSITION OF THE PERSON COMPLETING THIS FORM AND THE OCCUPATIONAL PROGRA
(such as registered nursing, data processing).

Check One:

Division/Department Chair _____
Faculty _____
Counselor _____
Other, please specify: _____ _____

Program: _____

PROE

FACULTY PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

Please answer the following: (Use back of page and extra sheets if necessary).

1. What are the chief occupational education strengths of your program?

- Faculty (dedicated, knowledgeable, innovative)
- Equipment - best in state + region
- Excellent reputation w/ employers of grads
- Ongoing support of clinical affiliates
- Enthusiasm of students in program

2. What are the major needs for improvement in your program and what action is required to achieve these improvements?

- Another faculty member to assume responsibility for content in hematology, body fluids, hemostasis
- Tech support to convert courses to off campus delivery
- Marketing to potential students to use available capacity + then support to be able to accommodate increased numbers. Our reputation is for quality. We cannot double enrollment + cert →

PLEASE IDENTIFY THE POSITION OF THE PERSON COMPLETING THIS FORM AND THE OCCUPATIONAL PROGRAM (such as registered nursing, data processing).

Check One:

Division/Department Chair	___
Faculty	X
Counselor	___
Other, please specify:	___ _____

Program: CLS

Survey Results (Included Responses)

CLS Survey of Advisory Committe and Clinical Adjunct Advisors

Report created on: Sunday, July 31, 2005 11:57:00 AM

The results of your survey are displayed below. If your survey includes text responses, click the "View" button to read individual results. To exclude a particular response, click the Included Responses button. You can then view the set of individual responses that are currently included and select those you wish to exclude. Results below contain only Included responses

EXCLUDE BLANK RESPONSES

Launch Date	07/21/2005 - 12:22 PM
Modified Date	07/31/2005 - 11:56 AM
Close Date	
Email Invites	20
Visits	12 (60%)
Partials	0 (0%)
Completes	10 (50%)

Go to Individual Complete Responses:

☐ Show respondent's emails.

INCLUDED RESPONSES

EXCLUDED RESPONSES

Included Respondents: 10
Excluded Respondents: 0

- Cross Tabulate
  Cross reference multiple questions
- Download Results
  Receive results in spreadsheet format
- View Recipient Status
  Check the response status of each of your recipients

Responses: ◉ Completes only ○ Partials only ○ Completes & Partials

1. Name and Institution

VIEW 10 Responses

2. We provide clinical experience for the following Ferris State University students:

	Number of Responses	Response Ratio
Medical Technology (MT)	8	80%
Medical Laboratory Technician (MLT)	6	60%
Phlebotomy (PBT)	2	20%

Please complete the following survey as part of the Academic Review Process at FSU. Use the following rating scale for questions 1-5:

5 = excellent, nearly ideal, top 5-10%
4 = Good, strong, top one-third
3 = Acceptable, average, the middle third
2 = Below expectations, fair, bottome one third

1 = Poor, seriously inadequate, bottom 5-10%
NA = not applicable, unkown

3. Instructional program content is:

The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	1 Poor, seriously inadequate, bottom 5-10%	2 Below expectations, fair, bottome one third	3 Acceptable, average, the middle third	4 Good, strong, top one-third	5 Excellent, nearly ideal, top 5-10%	N/A
1. A) Based on performance objectives that represent job skills and knowledge required for successful entry level employment.	0% 0	0% 0	0% 0	50% 5	50% 5	0% 0
2. B) Designed to provide students with practical job application experience.	0% 0	0% 0	0% 0	20% 2	80% 8	0% 0
3. C) Periodically reviewed and revised to keep current with changing job practices and technology.	0% 0	0% 0	0% 0	50% 5	50% 5	0% 0

VIEW 1 Responses

4. The on-campus instructional equipment for student learning is current and representative of that used on the job.

	Number of Responses	Response Ratio
Poor, seriously inadequate, bottom 5-10%	0	0%
Below expectations, fair, bottome one third	0	0%
Acceptable, average, the middle third	0	0%
Good, strong, top one-third	5	50%
excellent, nearly ideal, top 5-10%	5	50%
NA: not applicable, unknown	0	0%
Total	10	100%

5. The on-campus instructional facilities allocate sufficient space to support quality instruction.

	Number of Responses	Response Ratio
Poor, seriously inadequate, bottom 5-10%	0	0%
Below expectations, fair, bottome one third	0	0%
Acceptable, average, the middle third	2	20%
Good, strong, top one-third	2	20%
excellent, nearly ideal, top 5-10%	4	40%
NA = not applicable, unkown	2	20%
Total	10	100%

6. Job opportunities exist for students completing the program

	Number of Responses	Response Ratio
Poor, seriously inadequate, bottom 5-10%	0	0%
Below expectations, fair, bottome one third	0	0%
Acceptable, average, the middle third	0	0%
Good, strong, top one-third	0	0%
excellent, nearly ideal, top 5-10%	10	100%
NA = not applicable, unkown	0	0%
Total	10	100%

7. From your perspective, what are the major strengths of the Clinical Laboratory Science programs?

VIEW 9 Responses

8. From your perspective, what are the major areas of improvement that you WOULD LIKE TO SEE in the Clinical Laboratory Science programs?

VIEW 8 Responses

9. From your perspective, what are the major areas of improvement that you HAVE EXPERIENCED in the Clinical Laboratory Science programs?

VIEW 7 Responses

10. Please list any other comments you would like to make concerning the Clinical Laboratory Science Programs.

VIEW 6 Responses

11. May we contact you to follow-up on your answers to this survey?

	Number of Responses	Response Ratio
Yes	9	90%
No	1	10%
Total	10	100%

home

Survey Results (Included Responses)

REPORT OVERVIEW

CLS Survey of Advisory Committe and Clinical Adjunct Advisors

Questions that required written responses are displayed by individual query. The "Report Overview" button or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

3. Instructional program content is:

#	Response
1	B) Designed to provide students with practical job application experience. FSU's SimLab is one of the best programs to give students practicaL EXPERIENCE before their internship.

home

Survey Results (Included Responses)

REPORT OVERVIEW

CLS Survey of Advisory Committe and Clinical Adjunct Advisors

Questions that required written responses are displayed by individual query. The "Report Overview" button or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

7. From your perspective, what are the major strengths of the Clinical Laboratory Science programs?

#	Response
1	The major strength that Ferris State has is the on-campus "real life" training that the students experience. The on-campus clinical experience is very important to the future success of the students.
2	Students are well prepared to enter a vacant job position with minimal additional training.
3	Students from Ferris are very well prepared and have much more clinical experience-because of well prepared laboratories on campus.
4	Sim Lab...It provides the student with an idea of what career they are getting into.
5	Practical application is taught before the students reach their internship sites.
6	That we get actual lab experience instead of just classroom work and then being put in a laboratory atmosphere. And then discovering that we don't like it.
7	Dedicated faculty committed to students being successful, and, excelelnt SimLab experiences that give their students a head start in their internship.
8	Simulated laboratory experience!!
9	Good communication, working with students and instructors, listening to needs, keeping up with current technology.

Survey Results (Included Responses)

REPORT OVERVIEW

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Questions that required written responses are displayed by individual query. The "Report Overview" button or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

8. From your perspective, what are the major areas of improvement that you WOULD LIKE TO SEE in the Clinical Laboratory Science programs?

#	Response
1	I would like to see a class in "Critical Thinking Skills". If that is not possible, then I would like to see more chemistry and/or physics and/or mathematical - statistical classes required.
2	Additional Management training especially in MT program to include teaching, providing presentations and understanding of accreditation requirements.
3	Better equipment for learning. Tools provided for the instructors to help them achieve their expectations.
4	Emphasis on molecular technology since this is huge as an up and coming dept. in most large hospital facilities
5	More instructors! Not such spaced out schedules.
6	***Increased faculty positions (Clinical Chemist and Molecular Biologist).
7	More statistics, westgard rules. Projects such as new instrumentaion or correlations. A strong understanding of CLIA regulations (not so much of the why) ex. regulated testing, QC requirements, acceditation requirements.
8	students knowing exactly what to expect from a clinical internship, part of their education and need to take it seriously

Survey Results (Included Responses)

REPORT OVERVIEW

CLS Survey of Advisory Committe and Clinical Adjunct Advisors

Questions that required written responses are displayed by individual query. The "Report Overview" button or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

9. From your perspective, what are the major areas of improvement that you HAVE EXPERIENCED in the Clinical Laboratory Science programs?

#	Response
1	I don't believe that there have been any major improvements.
2	More independence from students with greater initiative to learn and perform procedures and participate in projects and tasks.
3	Interaction with FSU via internet.
4	Computer applications for the lab
5	Theiy have always had a great program. Their current faculty (too small) is very hard working and dedicated.
6	project planning and implementation
7	On line communication and tests and test taking improved, goals, outcomes are updated.

Survey Results (Included Responses)

REPORT OVERVIEW

CLS Survey of Advisory Committe and Clinical Adjunct Advisors

Questions that required written responses are displayed by individual query. The "Report Overview" button or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

10. Please list any other comments you would like to make concerning the Clinical Laboratory Science Programs.

#	Response
1	n/a
2	Need to solicite high schools and other areas for potential CLS students so that staff will be available in the future to replace retiring workers (our lab has many technical employees who will be leaving the workforce in the near future).
3	Since teaching at Munson, I have noticed that FSU students are much better prepared for clinical experience then students from other programs. I teach in microbiology.
4	I always hear great things about the FSU students and graduates from their sites and employers. Keep up the great work
5	Some of the prereqs I would consider rethinking.
6	Michigan hospitals, and our Hospital Laboratory in particular, would be seriously handicapped if Ferris' program in Clinical Laboratory Science were to not recieve significant support from Ferris administration. With the expected high numbers of Clinical Laboratoy Scientists expected to retire in the very near future (myself included!), extra effort at recruiting more stucdents at Ferris is critical.

STUDENT PERCEPTIONS OF OCCUPATIONAL EDUCATION PROGRAMS

INSTRUCTIONS: Rate each item using the following guide:

6 Don't Know
5 Excellent means nearly idea, top 5 to 10%
4 Good is a strong rating, top one-third
3 Acceptable is average, the middle-third
2 Below Expectations is only fair, bottom one-third
1 Poor is seriously inadequate, bottom 5 to 10%

A comment column has been provided if you wish to explain your rating

COMMENTS			**1**	**2**	**3**	**4**	**5**	**6**	
Please rate each item below:									
Courses in your occupational program are:									
• Available and conveniently located	1		1	5	1	7			
• Based on realistic prerequisites	2		1	2	5	5			
• Available at moderate cost	3	1	4	7		2			
Written objectives for courses in your occupational Program:									
• Are available to students.	4			1	1	12			
• Describe what you will learn in the course	5			1	1	12			
• Are used by the instructor to keep you aware of your progress	6			1	2	10			
Teaching methods, procedures and course content:									
• Meet your occupational needs, interests and objectives.	7				5	7	1		
• Provide supervised practice for developing job skills	8			1	3	8	1		
Related courses (such as English, Mathematics, Science) are:									
• Pertinent to occupational instruction	9			6	5	1	1		
• Current and meaningful to you	10			8	3	1	1		
Work experience (or clinical experience) in your Occupational program is:									
• Readily available at convenient locations.	11		1	1	3	5	3		
• Readily available to both day & evening students	12		1	2	1	3	6		
• Coordinated with classroom instruction	13				2	6	5		
• Coordinated with employer supervision	14			1	2	5	5		
Career planning information:									
• Meets your needs and interests	15			2	4	7			
• Helps you plan your program	16			2	3	8			
• Helps you make career decisions and choices	17			1	4	8			

Career planning information (Continued):								
• Helps you understand your rights and Responsibilities as an employee	18			2	3	5	3	
• Helps you evaluate job opportunities in relation to salary, benefits and conditions of employment	19			4	4	4	1	
• Is provided by knowledgeable, interested staff	20			2	3	8		
• Explains nontraditional occupational Opportunities for both sexes	21		1	3	2	4	3	
Job success information on former students in your occupational program:								
• Is provided to help you make career decisions	22	1	2	1	2	6	1	
• Indicates how many job opportunities there are in your occupation	23	1	2	1	3	6		
• Identifies where these job opportunities are located	24	1	1	1	3	5	2	
• Tells about job advancement opportunities	25	1		4	2	5	1	
Placement services are available to:								
• Help you find employment opportunities	26		1	1	3	4	4	
• Prepare you to apply for a job	27			1	3	4	5	
Occupational instructors:								
• Know the subject matter and occupational Requirements	28			1	1	9	2	
• Are available to provide help when you need it	29			1	1	9	2	
• Provide instruction so it is interesting and understandable	30			3	8	2	2	
Instructional support services (such as tutoring, lab assistance) are:								
• Available to meet your needs and interests	31			3	1	7	3	
• Provided by knowledgeable, interested staff	32			2	3	6	2	
Instructional lecture and laboratory facilities:								
• Provide adequate lighting, ventilation, heating, and other utilities	33		1	4	2	5		
• Include enough work stations for the number of students enrolled	34			3	2	8		
• Are safe, functional, and well maintained.	35			4	3	6		
• Are available on an equal basis for all students	36			2	5	6		
Instructional equipment is								
• Current and representative of industry	37		1	4	2	5	1	
• In sufficient quantity to avoid long delays in use	38		2	4	2	5		
• Safe and in good condition	39		2	3	2	6		
Instructional materials(e.g., textbooks, reference Books, supplies) are:								
• Available and conveniently located for use as needed	40			2	2	9		
• Current and meaningful to the subject	41			1	2	10		
• Not biased toward "traditional" sex roles	42			1	3	7	2	
• Available at reasonable cost	43		2	7	1	3		

Student Comments

Survey Item Number	Comment
1.	• Not convenient for commuter/employed student
2.	• People with experience shouldn't have to take CCHS courses
3.	• Tuition increase
	• Tuition high
	• Tuition has gone up too many times in the 3 years I've been here. I almost had to drop out (I know this is a problem everywhere)
	• Could be cheaper for non-degree courses
7.	• The CLS program does an excellent job of putting its student in "real life" situations before "real life" begins giving them an advantage to others entering the field.
8.	• Small class size allows for good supervision and Q & A.
11.	• My work experience allowed me to understand why things are the way they are.
12.	• Intern is after classes
15.	• I would like to know more about or how to continue my education in different parts of the laboratory
19	• This is an area that could be developed a bit more.
24.	• Posting of job opportunities is done all the time
26.	• Most of the time this is not needed. We usually get placed where we intern – it just happens that way.
33.	• It gets too hot for instrumentation. We just got new chairs and we are all very grateful.
34.	• Need more tables
35.	• Lab manager not stocking things like they need to be.
37.	• Some is good, some old. Need microscopes
	• Some instruments needs professional attention that costs a lot of money but would be worth it if we could get it.
	• If CLS cold have service contracts on the instruments

Ferris State University
Clinical Laboratory Sciences Programs
Survey of Employers of Graduates

Name of FSU graduate: _____

Laboratory: _____

Approximate date of hire: _____

Questions 1 – 14 are part of a nationwide benchmarking survey of the employers of graduates of accredited Clinical Laboratory Sciences programs.

The Ferris State University graduate named above:

1. Demonstrates the required technical skills for the position

consistently	usually	occasionally	rarely
4	3	2	1

2. Applies theoretical knowledge

consistently	usually	occasionally	rarely
4	3	2	1

3. Meets workload demands after orientation

consistently	usually	occasionally	rarely
4	3	2	1

4. Solves problems/troubleshoots

consistently	usually	occasionally	rarely
4	3	2	1

5. Prioritizes/organizes, and completes multiple tasks

consistently	usually	occasionally	rarely
4	3	2	1

6. Is adaptable and flexible

consistently	usually	occasionally	rarely
4	3	2	1

7. Shows a positive attitude

consistently	usually	occasionally	rarely
4	3	2	1

8. Interacts well with others

consistently	usually	occasionally	rarely
4	3	2	1

9. Functions as a team player

consistently	usually	occasionally	rarely
4	3	2	1

10. Behaves professionally

consistently	usually	occasionally	rarely
4	3	2	1

11. Recognizes limitations and seeks help when appropriate

consistently	usually	occasionally	rarely
4	3	2	1

12. Shows initiative

consistently	usually	occasionally	rarely
4	3	2	1

13. Is customer-service oriented

consistently	usually	occasionally	rarely
4	3	2	1

14. Communicates effectively

consistently	usually	occasionally	rarely
4	3	2	1

15. To what sections of the laboratory is the FSU graduate assigned? Check all that apply.

Blood bank		Histology	
Chemistry		Immunology	
Coagulation		Microbiology	
Cytology		Phlebotomy	
EKG		Urinalysis	
Hematology		Other (specify)	

16. In addition to routine bench testing, what duties does the FSU graduate perform? Check all that apply.

Blood component prep processing		Proficiency testing	
Complex problem solving		Quality assurance team member	
Consulting with physicians/other staff		Quality control	
Drawing blood donors		Scheduling personnel	
Evaluating new instruments/ procedures		Specimen collection	
Instrument maintenance		Specimen processing	
Marketing lab services		Teaching students	
Ordering supplies		Training personnel	
		Other (specify)	

17. How could this employee have been better prepared to assume his or her duties in your lab? Please comment.

18. Was there any aspect in which this employee was NOT adequately prepared? Please comment.

19. Based on your experience with this employee, would you consider hiring another graduate of Ferris State University?

_____ Yes _____ No Comments:

20. What is your laboratory's skill mix of MTs and MLTs? Are you considering any changes in this ratio?

21. Have you experienced difficulty in the last two years in hiring and retaining capable employees?

_____ Yes _____ No Comments:

22. What are your projected employment needs?

6 months: _____

12 months: _____

2 years: _____

23. What are some emerging skills or competencies that you predict will be needed for future laboratorians?

24. Please make any other comments that would help us evaluate the Clinical Laboratory Sciences program at Ferris State University. Thank you.

Ferris State University
Clinical Laboratory Sciences Program
Survey of Graduates

1. What is your current job title?

_____ Medical technologist

_____ Medical Laboratory Technician

_____ Other (specify) _____

2. How long have you been employed in your current position? (How many months?)

3. In a typical week, how many hours do you work in your current position? (number of hours)

4. What type of shifts do you work at your current position? Please check all that apply.

_____ 8 hour shifts _____ 12 hour shifts

_____ 10 hour shifts _____ Less than 8 hour shifts

5. What is your certification status? Please check all that apply.

____ CLT certified (NCA) _____ CLS certified (NCA)

____CLT eligible (NCA) _____ CLS eligible (NCA)

____ MLT certified (ASCP) _____ MT certified (ASCP)

____ MLT eligible (ASCP) _____ MT eligible (ASCP)

The next set of questions pertains to the knowledge that you acquired in your program. Please indicate your level of agreement with each of the following statements.

6. The program helped me to learn the clinical laboratory knowledge appropriate to my current position.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

7. The program helped me to learn the clinical laboratory knowledge appropriate to my level of training.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

8. The program helped me to acquire the knowledge to perform my job duties accurately and efficiently.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

9. The program prepared me to interpret test results effectively.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

10. The program trained me to use sound judgment while functioning in the health care setting.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

The next set of questions pertains to the clinical skills you acquired in your program. Please indicate your level of agreement with each of the following statements.

11. The program prepared me to perform laboratory testing appropriate to my level of training.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

12. The program prepared me to learn to operate new analyzers/test systems easily.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

13. The program prepared me to interpret diagnostic test results appropriate to my level of training.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

14. The on – campus simulated laboratory helped me to prepare for my clinical experience.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

15. My clinical experience helped me to prepare for my current employment.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

The next set of questions pertains to the behavioral skills you acquired in your program. Please indicate your level of agreement with each of the following statements.

16. The program prepared me to communicate effectively in the health care setting.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

17. The program prepared me to behave in an ethical and professional manner.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

18. The program taught me to manage my time effectively while functioning in the clinical laboratory.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

19. The program encouraged me to apply for and pass national certification examinations.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

The next set of questions deals with general information about your activities since your graduation.

20. I have actively pursued national certification.

Yes No

21. I actively participate in continuing education activities.

Yes No

22. I am a member of a state clinical laboratory professional association.

Yes No

23. I am a member of the American Society for Clinical Laboratory Science.

Yes No

24. I am a member of other professional associations:

American Association of Blood Banks

Yes No

American Association for Clinical Chemistry

Yes No

Clinical laboratory Management Association

Yes No

American Society for Clinical Pathology

Yes No

Other (list):

The following are questions to assess your overall level of agreement with the following statements about the Clinical Laboratory Science Program.

25. The academic advising was effective.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

26. I would recommend this program to someone considering a career in clinical laboratory science.

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

27. How easy was it for you to find employment in a clinical laboratory?

Strongly agree	Generally agree	Neutral	Generally disagree	Strongly disagree
5	4	3	2	1

28. Please rate the overall quality of the program in preparing you to work in the clinical laboratory.

29. Based on your employment experience, please identify 2 – 3 strengths of the program.

30. Based on your employment experience, please make 2 – 3 suggestions to further strengthen the program.

31. What qualities/skills were expected of you upon employment that were NOT included in your program?

32. Please provide any comments/suggestions that would help us to prepare future graduates.

We would like to survey your supervisor to determine his or her opinion of how well you were prepared for your present position. This page, with your signature and address, will be removed before survey results are compiled, to protect your privacy.

I agree that the Clinical Laboratory Sciences program at Ferris State University may survey my supervisor about my preparation for my current employment:

YES NO

Signature _____

Name and mailing address of your current supervisor:

One more thing: for our alumni database, please tell us your current name, home address, e-mail, and telephone number:

Thank you!

Appendix E: Detailed Program Costing

Ferris State University
Degree Program Costing 2002- 2003 (Summer, Fall, and Winter)

College : Allied Health Sciences
artment : Health Related Programs

Program Name: Medical Technology BS

Program Credits Required (Total credits to graduate) **139**

*Instructor Cost per Student Credit Hour(SCH) (Average for program)	$180.05
**Department Cost per Student Credit Hour	$62.15
***Dean's Cost per Student Credit Hour	$21.62
Total Cost per Student Credit Hour (Average for program)	**$263.82**
Total Program Instructor Cost (Assumes a student will complete program in one year)	$25,026.58
Total Program Department Cost	$8,639.53
Total Program Dean's Cost	$3,005.05
Total Program Cost (Assumes a student will complete program in one year)	**$36,671.16**

Course ID	Level	Instructor Cost	Dept Cost	Dean's Cost	SCH's Produced	Instructor Cost/SCH	Dept Cost/SCH	Dean's Cost/SCH	Credits Required	Program Instructor Cost	Program Dept Cost	Program Dean's Cost
BIOL121	L	$96,440	$46,632	$9,048	1400	$69	$33	$6	4	$276	$133	$26
BIOL122	L	$81,488	$31,310	$6,075	940	$87	$33	$6	4	$347	$133	$26
BIOL205	L	$96,632	$40,637	$7,885	1220	$79	$33	$6	5	$396	$167	$32
BIOL286	L	$15,119	$899	$175	27	$560	$33	$6	3	$1,680	$100	$19
BIOL300	U	$72,932	$14,889	$2,889	447	$163	$33	$6	3	$489	$100	$19
CCHS101	L	$110,929	$66,236	$47,705	1359	$82	$49	$35	3	$245	$146	$105
CCHS102	L	$45,033	$22,225	$16,007	456	$99	$49	$35	1	$99	$49	$35
CCHS103	L	$19,362	$14,281	$10,285	293	$66	$49	$35	1	$66	$49	$35
CHEM114	L	$73,577	$18,074	$5,636	872	$84	$21	$6	4	$338	$83	$26
CHEM214	L	$11,671	$1,575	$491	76	$154	$21	$6	4	$614	$83	$26
CHEM324	U	$11,840	$1,617	$504	78	$152	$21	$6	3	$455	$62	$19
'.S101	L	$2,880	$1,347	$421	12	$240	$112	$35	1	$240	$112	$35
_S215	L	$10,293	$8,983	$2,808	80	$129	$112	$35	4	$515	$449	$140
CLLS224	L	$3,690	$6,737	$2,106	60	$62	$112	$35	3	$185	$337	$105
CLLS228	L	$15,395	$6,401	$2,001	57	$270	$112	$35	3	$810	$337	$105
CLLS230	L	$8,610	$6,401	$2,001	57	$151	$112	$35	3	$453	$337	$105
CLLS235	L	$17,283	$8,085	$2,527	72	$240	$112	$35	4	$960	$449	$140
CLLS240	L	$3,688	$4,267	$1,334	38	$97	$112	$35	2	$194	$225	$70
CLLS251	L	$12,493	$6,737	$2,106	60	$208	$112	$35	3	$625	$337	$105
CLLS355	U	$15,395	$5,727	$1,790	51	$302	$112	$35	3	$906	$337	$105
CLLS430	U	$7,792	$6,064	$1,896	54	$144	$112	$35	3	$433	$337	$105
CLLS435	U	$7,377	$7,187	$2,247	64	$115	$112	$35	4	$461	$449	$140
CLLS440	N	$15,024,716	$4,678,186	$2,265,380	96636	$155	$48	$23	2	$311	$97	$47
CLLS456	U	$8,264	$1,684	$527	15	$551	$112	$35	3	$1,653	$337	$105
CLLS459	U	$3,773	$1,909	$597	17	$222	$112	$35	1	$222	$112	$35
CLLS465	U	$4,982	$1,684	$527	15	$332	$112	$35	3	$996	$337	$105
CLLS491	U	$28,301	$8,422	$2,633	75	$377	$112	$35	15	$5,660	$1,684	$527
CLLS494	U	$1,887	$561	$176	5	$377	$112	$35	1	$377	$112	$35
CLLS499	U	$2,880	$561	$176	5	$576	$112	$35	1	$576	$112	$35
COMM221	L	$107,182	$18,033	$7,135	1104	$97	$16	$6	3	$291	$49	$19
CULTELE	E	$2,154,437	$364,278	$143,190	21562	$100	$17	$7	9	$899	$152	$60
EHSM315	U	$62,671	$23,395	$16,849	480	$131	$49	$35	3	$392	$146	$105
ENGL150	L	$583,812	$97,248	$39,767	6153	$95	$16	$6	3	$285	$47	$19
ENGL250	L	$525,942	$81,364	$33,272	5148	$102	$16	$6	3	$306	$47	$19
ENGL321	U	$261,432	$32,337	$13,223	2046	$128	$16	$6	3	$383	$47	$19
HCSA335	U	$25,699	$10,138	$7,301	208	$124	$49	$35	4	$494	$195	$140
MATH117	L	$45,306	$6,413	$3,904	604	$75	$11	$6	4	$300	$42	$26
MGMT301	U	$238,370	$50,380	$42,207	1926	$124	$26	$22	3	$371	$78	$66
MRIS102	L	$14,055	$13,696	$9,864	281	$50	$49	$35	1	$50	$49	$35
SOCAELE	E	$1,708,521	$465,750	$198,407	22845	$75	$20	$9	9	$673	$183	$78

* Instructor Cost - ***Salary & Fringe*** - the actual cost to teach a course
Department Cost - ***Departmental Level Non Instructor Compensation, Supplies and Equipment*** - departmental average applied to all course prefixes within a department
*** Dean's Cost - ***Dean's Level Non Instructor Compensation, Supplies and Equipment*** - college average applied to all course prefixes within a college

Source: Office of Institutional Research, g:\...\progcost\0203\progcost.rsl

Ferris State University
Degree Program Costing 2002- 2003 (Summer, Fall, and Winter)

College : Allied Health Sciences
Department : Health Related Programs

Program Name: Medical Laboratory Technology AAS

Program Credits Required (Total credits to graduate) 79

*Instructor Cost per Student Credit Hour(SCH) (Average for program)	$293.06
**Department Cost per Student Credit Hour	$66.96
***Dean's Cost per Student Credit Hour	$22.51
Total Cost per Student Credit Hour (Average for program)	**$382.52**
Total Program Instructor Cost (Assumes a student will complete program in one year)	$23,151.44
Total Program Department Cost	$5,289.88
Total Program Dean's Cost	$1,777.92
Total Program Cost (Assumes a student will complete program in one year)	**$30,219.24**

Course ID	Level	Instructor Cost	Dept Cost	Dean's Cost	SCH's Produced	Instructor Cost/SCH	Dept Cost/SCH	Dean's Cost/SCH	Credits Required	Program Instructor Cost	Program Dept Cost	Program Dean's Cost
BIOL108	L	$97,139	$37,972	$7,368	1140	$85	$33	$6	3	$256	$100	$19
BIOL205	L	$96,632	$40,637	$7,885	1220	$79	$33	$6	5	$396	$167	$32
CCHS101	L	$110,929	$66,236	$47,705	1359	$82	$49	$35	3	$245	$146	$105
CCHS102	L	$45,033	$22,225	$16,007	456	$99	$49	$35	1	$99	$49	$35
CCHS103	L	$19,362	$14,281	$10,285	293	$66	$49	$35	1	$66	$49	$35
CHEM114	L	$73,577	$18,074	$5,636	872	$84	$21	$6	4	$338	$83	$26
CHEM214	L	$11,671	$1,575	$491	76	$154	$21	$6	4	$614	$83	$26
CLLS101	L	$2,880	$1,347	$421	12	$240	$112	$35	1	$240	$112	$35
CLLS215	L	$10,293	$8,983	$2,808	80	$129	$112	$35	4	$515	$449	$140
CLLS224	L	$3,690	$6,737	$2,106	60	$62	$112	$35	3	$185	$337	$105
CLLS228	L	$15,395	$6,401	$2,001	57	$270	$112	$35	3	$810	$337	$105
LS230	L	$8,610	$6,401	$2,001	57	$151	$112	$35	3	$453	$337	$105
LS235	L	$17,283	$8,085	$2,527	72	$240	$112	$35	4	$960	$449	$140
CLLS240	L	$3,688	$4,267	$1,334	38	$97	$112	$35	2	$194	$225	$70
CLLS251	L	$12,493	$6,737	$2,106	60	$208	$112	$35	3	$625	$337	$105
CLLS256	L	$4,335	$337	$105	3	$1,445	$112	$35	3	$4,335	$337	$105
CLLS291	L	$11,065	$1,347	$421	12	$922	$112	$35	12	$11,065	$1,347	$421
COMM221	L	$107,182	$18,033	$7,135	1104	$97	$16	$6	3	$291	$49	$19
CULTELE	E	$2,154,437	$364,278	$143,190	21562	$100	$17	$7	3	$300	$51	$20
ENGL150	L	$583,812	$97,248	$39,767	6153	$95	$16	$6	3	$285	$47	$19
ENGL250	L	$525,942	$81,364	$33,272	5148	$102	$16	$6	3	$306	$47	$19
MATH117	L	$45,306	$6,413	$3,904	604	$75	$11	$6	4	$300	$42	$26
MRIS102	L	$14,055	$13,696	$9,864	281	$50	$49	$35	1	$50	$49	$35
SOCAELE	E	$1,708,521	$465,750	$198,407	22845	$75	$20	$9	3	$224	$61	$26

* Instructor Cost - ***Salary & Fringe*** - the actual cost to teach a course
** Depatment Cost - ***Departmental Level Non Instructor Compensation, Supplies and Equipment*** - departmental average applied to all course prefixes within a department
*** Dean's Cost - ***Dean's Level Non Instructor Compensation, Supplies and Equipment*** - college average applied to all course prefixes within a college

Clinical Lab Sciences

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Appendix F: The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)

Standards of Accredited Educational Programs for the Clinical Laboratory Technician/ Medical Laboratory Technician

PREAMBLE

OBJECTIVE

The purpose of these Standards and the Description of the Profession is to establish, maintain, and promote standards of quality for educational programs in the clinical laboratory sciences and to provide recognition for educational programs which meet or exceed the minimum standards outlined in this document.

The Standards are to be used for the development and evaluation of clinical laboratory technician/medical laboratory technician programs. Paper reviewers and site visit teams assist in the evaluation of the program's compliance with the Standards. Lists of accredited programs are published for the information of students, employers, and the public.

DESCRIPTION OF THE CLINICAL LABORATORY SCIENCE PROFESSION

The clinical laboratory professional is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. Clinical laboratory professionals perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients. The clinical laboratory professional has diverse and multi-level functions in the areas of analysis and clinical decision-making, information management, regulatory compliance, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed. Clinical laboratory professionals possess skills for financial, operations, marketing, and human resource management of the clinical laboratory. Clinical laboratory professionals practice independently and collaboratively, being responsible for their own actions, as defined by the profession. They have the requisite knowledge and skills to educate laboratory professionals, other health care professionals, and others in laboratory practice as well as the public.

The ability to relate to people, a capacity for calm and reasoned judgment and a demonstration of commitment to the patient are essential qualities. Communications skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education. Laboratory professionals demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.

DESCRIPTION OF CAREER ENTRY OF THE CLINICAL LABORATORY TECHNICIAN/MEDICAL LABORATORY TECHNICIAN

At career entry, the clinical laboratory technician/medical laboratory technician will be able to perform routine clinical laboratory tests (such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation, molecular, and other emerging diagnostics) as the primary analyst making specimen oriented decisions on predetermined criteria, including a working knowledge of critical values. Communications skills will extend to frequent interactions with members of the healthcare team, external relations, customer service and patient education. The level of analysis ranges from waived and point of care testing to complex testing encompassing all major areas of the clinical laboratory. The clinical laboratory technician/medical laboratory technician will have diverse functions in areas of pre-analytical, analytical, post-analytical processes. The clinical laboratory technician/medical laboratory technician will have responsibilities for information processing, training, and quality control monitoring wherever clinical laboratory testing is performed.

Standards of Accredited Educational Programs
For the
Clinical Laboratory Technician/Medical Laboratory Technician

REQUIREMENTS FOR ACCREDITATION

I. SPONSORSHIP

1. Institutional Affiliation

The sponsoring institution and affiliates, clinical and/or academic, if any, must be accredited by recognized regional and/or national agencies.

In programs in which the education is provided by two or more institutions, responsibilities of the sponsoring institution and of each affiliate for program administration, instruction, and supervision must be described in writing and signed by both parties. All provisions of the agreement must be active with written documentation of the following items:

A. General

1. Reason for the agreement
2. Responsibilities of the academic facility
3. Responsibilities of the clinical facility
4. Joint responsibilities

B. Specific

1. Supervisory responsibilities for the students
2. Student professional liability coverage
3. Student health and safety policies
4. Provision for renewal
5. Termination clause providing for program completion of enrolled students

2. Acceptable Institutions

Educational programs must be established in:

A. colleges and universities;
B. community and junior colleges;
C. vocational technical schools authorized to grant the associate degree,
D. hospitals and medical centers;
E. other post-secondary institutions or consortia which meet comparable standards for education in clinical laboratory science.

3. Sponsoring Institution's Responsibilities

Accreditation is granted to the institution that assumes primary responsibility for curriculum planning and selection of course content; coordinates classroom teaching and applied education;

appoints faculty to the program; receives and processes applications for admission, and grants the associate degree or certificate documenting completion of the program.

A. The sponsoring institution or consortium must be responsible for providing assurance that the activities assigned to students in the clinical setting are educational.

B. There must be documented ongoing communication between the sponsoring institution and its affiliates for exchange of information and coordination of the program.

II. RESOURCES

4. General Resources

Resources must support the number of students admitted into the program. The instructor to student ratio must be adequate to achieve the stated program goals.

5. Program Administration

A. Program Director

1. The program must have a qualified program director.

2. Responsibilities

   The program director must be responsible for the organization, administration, periodic review, planning, development, evaluation and general effectiveness of the program. The program director must have input into budget preparation and must be responsible for maintaining NAACLS approval of the program.

3. Qualifications

   The program director must be a clinical laboratory scientist/medical technologist who holds nationally recognized certification and who has a master's or doctoral degree and three years of experience in clinical laboratory science education that includes teaching courses, conducting and managing learning experiences, evaluating student achievement, providing input into curriculum development, policy and procedure formulation, and evaluation of program effectiveness. The program director must have a knowledge of education methods and administration as well as current accreditation and certification procedures.

4. Faculty Appointments

   The program director must have a faculty appointment at the sponsoring institution or must have faculty appointments in each affiliated academic institution. In the case of a clinically based program, the program director's appointment at affiliated academic institutions may be a regular one, a non-salaried clinical or courtesy appointment, or an adjunct appointment, depending upon the regulations of the academic institution.

B. Advisory Committee

1. There must be an advisory committee composed of individual(s) from the community of interest (i.e. pathologists, other physicians, scientific consultants, academic professionals, administrators, practicing clinical laboratory scientists/medical technologists, practicing clinical laboratory technicians/medical laboratory technicians and other professionals) who have knowledge of clinical laboratory science education.

2. Responsibilities

   The advisory committee of the program shall have input into any aspect of the program/curriculum with regard to its current relevancy and effectiveness.

6. Faculty

The program must have qualified faculty (e.g., clinical laboratory scientists/medical technologists, clinical laboratory technicians/medical laboratory technicians, administrators, managers and physicians).

A. Responsibilities

The faculty must participate in teaching courses, supervising applied laboratory learning experiences, evaluating student achievement, developing curriculum, formulating policy and procedure, and evaluating program effectiveness.

B. Qualifications

Faculty designated by the program must demonstrate adequate knowledge and proficiency in their content areas and the ability to teach effectively at the appropriate level.

C. Professional Development

The program must assure and document ongoing professional development of the program faculty to assure that the faculty members are able to fulfill their instructional responsibilities.

7. Financial Resources

Financial resources for continued operation of the educational program must be ensured by an adequate, institutionally approved budget or by a statement of continued financial support from an executive officer of the sponsoring institution.

8. Physical Resources

A. Facilities

Classrooms, laboratories, administrative offices and other facilities must be adequate, equipped for safety, and must be in compliance with pertinent governmental laws.

B. Equipment and Supplies

Each student must have reasonable access to and experience with modern equipment and supplies.

C. Information Resources

Each student must have reasonable access to information resources containing current editions of books, periodicals and other reference materials in contemporary formats related to all content areas of the curriculum.

D. Instructional Resources

Adequate instructional resources must be available to facilitate each student's attainment of entry level competencies.

E. Computer Technology

Each student must have access to and experience with contemporary computer technology.

III. CURRICULUM

9. Curricular Requirements

A. Curricular Structure

Instruction must follow a plan which documents a structured curriculum composed of general education, basic sciences, mathematics, and professional courses including applied (clinical) education. The curriculum must include clearly written program goals and competencies and course syllabi which must include individual course goals and objectives.

The curriculum must include all the major subject areas currently offered in the contemporary clinical laboratory. Behavioral objectives which address cognitive, psychomotor, and affective domains must be provided for didactic and applied (clinical practice) aspects of the program and must include clinical significance and correlation. Course objectives must show progression to the level consistent with entry into the profession.

The applied courses must be taught in a clinically equipped teaching laboratory on the college campus, in an affiliated clinical facility, or in both facilities sufficient for developing basic skills, understanding principles, and mastering the procedures involved.

B. Instructional Areas

The curriculum must include principles of:

1. Methodologies for all major areas currently practiced by a modern clinical laboratory, including problem solving and troubleshooting techniques;
2. Collecting, processing, and analyzing biological specimens and other substances;
3. Laboratory result use in diagnosis and treatment;
4. Communications sufficient to serve the needs of patients and the public;
5. Technical training sufficient to orient new employees;
6. Quality assessment in the laboratory;

7. Laboratory safety and regulatory compliance;
8. Information processing in the clinical laboratory;
9. Ethical and professional conduct, and;
10. Significance of continued professional development.

C. Learning Experiences

The learning experiences needed in the curriculum to develop and support entry level competencies must be properly sequenced and include instructional materials, classroom presentations, discussion, demonstrations, laboratory sessions, supervised practice and experience.

1. Student experiences must be educational and balanced so that all competencies can be achieved.

2. Student experiences at different clinical sites must be comparable to enable all students to achieve entry level competencies.

3. Policies and processes by which students may perform service work must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. After demonstrating proficiency, students, with qualified supervision, may be permitted to perform procedures. Service work by students in clinical settings outside of academic hours must be noncompulsory.

D. Evaluations

Written criteria for passing, failing, and progression in the program must be provided. These must be given to each student at the time of entry into the program. Evaluation systems must be related to the objectives and competencies described in the curriculum for both didactic and applied education components. They must be employed frequently enough to provide students and faculty with timely indications of the students' academic standing and progress and to serve as a reliable indicator of the effectiveness of instruction and course design.

IV. STUDENTS

10. Program Description/Publications

Students must be provided with a clear description of the program and its content and current publications, which must include:

A. program mission statement;
B. program goals and competencies;
C. course objectives;
D. applied education assignments, (if applicable);
E. admission criteria, both academic and non-academic;
F. a list of course descriptions;
G. names and academic rank or title of the program director and faculty;
H. tuition and fees with refund policies;
I. causes for dismissal;
J. rules and regulations;

K. a listing of clinical facilities (if applicable);
L. essential functions, and;
M. policies and procedures when applied experience cannot be guaranteed.

11. Admissions

Admission of students, including advanced placement if available, must be made in accordance with the clearly defined and published practices of the institution. Specific academic standards and essential functions required for admission to the program must be clearly defined, published and provided to prospective students and made available to the public. The signature of the student indicating full understanding of the policies for progression in the program and completion of the program must be secured.

12. Acceptable Conduct

Rules and regulations governing acceptable personal and academic conduct must be defined and provided to all students upon entering the program.

13. Student Records

Student records must be maintained for admission, evaluation, and counseling or advising sessions. Individual grades and credits for courses must be recorded and permanently maintained by the sponsoring institution. The program must maintain the student records, conforming to any governmental regulations and the regulations of any other accrediting agencies.

14. Health and Safety

There must be a procedure for determining that each applicant's or student's health will permit the individual to meet the written essential functions of the program. Students must be informed of and have access to the usual student health care services of the institution. The health and safety of students, faculty, and patients associated with educational activities must be safeguarded. Emergency medical care must be available for students while in attendance.

15. Guidance

Guidance must be available to assist students in understanding and observing program policies and practices, for advising on professional and career issues, and for providing counseling or referral for personal and financial problems that may interfere with progress in the program. Confidentiality and impartiality must be maintained in dealing with student problems.

16. Appeal Procedures

Appeal procedures must be distributed to students upon entering the program. They must include provisions for academic and non-academic types of grievances and a mechanism for neutral evaluation that ensures due process and fair disposition.

V. OPERATIONAL POLICIES

17. Fair Practices

A. Programmatic announcements must accurately reflect the program offered and include NAACLS' name, address and phone number.

B. Student recruitment and admission must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

C. Faculty recruitment and employment practices must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

D. Academic credits and costs to the student must be accurately stated, published, and made known to all applicants.

E. Policies and procedures for student withdrawal and refunds of tuition and fees must be published and made known to all applicants.

F. If more than one clinical laboratory science program is offered at an institution, the sponsoring institution must demonstrate that each program is being conducted to assure appropriate instruction for the students at the different educational levels.

G. The program must culminate in an associate degree or in a certificate for the student who enters the program with an associate degree or higher. The granting of the degree or certificate must not be contingent upon the student's passing any type of external certification or licensure examination. Academic standards for the program must be acceptable to the institution that grants the degree or certificate.

H. A written record of all formal student complaints and resolution must be maintained.

I. Program evaluation information, including graduation, placement and any certification pass rates must be made available to NAACLS upon request.

VI. PROGRAM EVALUATION

18. Systematic Review

There must be a mechanism for continually and systematically reviewing the effectiveness of the program to include survey and evaluation instruments that incorporate feedback from a combination of students, employers, faculty, graduates, exit or final examinations, and accreditation review.

19. Outcome Measures

A review of outcomes measures (e.g. external certifying examination results, results from capstone projects) from the last three active years must be documented, analyzed and used in the program evaluation.

20. Graduation and Placement Rates

A review of graduation rates and placement rates must be documented, analyzed and used in the program evaluation.

21. Program Evaluation and Modification

The results of program evaluations must be documented and reflected in ongoing curriculum development and program modification, followed by an analysis of the effectiveness of any changes implemented.

VII. MAINTAINING ACCREDITATION

22. Program/Sponsoring Institution Responsibilities

Programs are required to comply with administrative requirements for maintaining accreditation, including:

A. Submitting the Self-Study Report, an Application for Continuing Accreditation, or a required Progress Report as determined by NAACLS;

B. Paying accreditation fees, as determined by NAACLS;

C. Informing NAACLS of relevant administrative and operational changes within 30 days. This includes changes in program official names, addresses or telephone numbers; affiliates, status (e.g., inactivity, closure) or location; and institution name;

D. Completing an Annual Report prescribed by NAACLS and returning it by the established deadline;

E. Verifying compliance with these Standards upon request from NAACLS, and;

F. Agreeing to a site visit date before the end of the period for which accreditation was awarded.

Standards of Accredited Educational Programs for the Clinical Laboratory Scientist/ Medical Technologist

PREAMBLE

OBJECTIVE

The purpose of these Standards and the Description of the Profession is to establish, maintain, and promote standards of quality for educational programs in the clinical laboratory sciences and to provide recognition for educational programs which meet or exceed the minimum standards outlined in this document.

The Standards are to be used for the development and evaluation of clinical laboratory science/medical technology programs. Paper reviewers and site visit teams assist in the evaluation of the program's compliance with the Standards. Lists of accredited programs are published for the information of students, employers, and the public.

DESCRIPTION OF THE CLINICAL LABORATORY SCIENCE PROFESSION

The clinical laboratory professional is qualified by academic and applied science education to provide service and research in clinical laboratory science and related areas in rapidly changing and dynamic healthcare delivery systems. Clinical laboratory professionals perform, develop, evaluate, correlate and assure accuracy and validity of laboratory information; direct and supervise clinical laboratory resources and operations; and collaborate in the diagnosis and treatment of patients. The clinical laboratory professional has diverse and multi-level functions in the areas of analysis and clinical decision-making, information management, regulatory compliance, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed. Clinical laboratory professionals possess skills for financial, operations, marketing, and human resource management of the clinical laboratory. Clinical laboratory professionals practice independently and collaboratively, being responsible for their own actions, as defined by the profession. They have the requisite knowledge and skills to educate laboratory professionals, other health care professionals, and others in laboratory practice as well as the public.

The ability to relate to people, a capacity for calm and reasoned judgment and a demonstration of commitment to the patient are essential qualities. Communications skills extend to consultative interactions with members of the healthcare team, external relations, customer service and patient education. Laboratory professionals demonstrate ethical and moral attitudes and principles that are necessary for gaining and maintaining the confidence of patients, professional associates, and the community.

DESCRIPTION OF CAREER ENTRY OF THE CLINICAL LABORATORY SCIENTIST/MEDICAL TECHNOLOGIST

At career entry, the clinical laboratory scientist/medical technologist will be proficient in performing the full range of clinical laboratory tests in areas such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation,

molecular, and other emerging diagnostics, and will play a role in the development and evaluation of test systems and interpretive algorithms. The clinical laboratory scientist/medical technologist will have diverse responsibilities in areas of analysis and clinical decision-making, regulatory compliance with applicable regulations, education, and quality assurance/performance improvement wherever laboratory testing is researched, developed or performed. The clinical laboratory scientist/medical technologist will also possess basic knowledge, skills, and relevant experiences in:

A. Communications to enable consultative interactions with members of the healthcare team, external relations, customer service and patient education;
B. Financial, operations, marketing, and human resource management of the clinical laboratory to enable cost-effective, high-quality, value-added laboratory services;
C. Information management to enable effective, timely, accurate, and cost-effective reporting of laboratory-generated information, and;
D. Research design/practice sufficient to evaluate published studies as an informed consumer.

Standards of Accredited Educational Programs
for the
Clinical Laboratory Scientist/Medical Technologist

REQUIREMENTS FOR ACCREDITATION

I. SPONSORSHIP

1. Institutional Affiliation

The sponsoring institution and affiliates, clinical and/or academic, if any, must be accredited by recognized regional and/or national agencies.

In programs in which the education is provided by two or more institutions, responsibilities of the sponsoring institution and of each affiliate for program administration, instruction, and supervision must be described in writing and signed by both parties. All provisions of the agreement must be active with written documentation of the following items:

A. General

1. Reason for the agreement
2. Responsibilities of the academic facility
3. Responsibilities of the clinical facility
4. Joint responsibilities

B. Specific

1. Supervisory responsibilities for the students
2. Student professional liability coverage
3. Student health and safety policies
4. Provision for renewal
5. Termination clause providing for program completion of enrolled students

2. Acceptable Institutions

Educational programs must be established in:

A. colleges and universities;
B. hospitals and medical centers;
C. medical laboratories, and;
D. other institutions or consortia which meet comparable standards for education in clinical laboratory science.

3. Sponsoring Institution's Responsibilities

Accreditation is granted to the institution that assumes primary responsibility for curriculum planning and selection of course content; coordinates classroom teaching and applied education, appoints faculty to the program, receives and processes applications for admission, and grants the baccalaureate or higher degree or certificate documenting completion of the program.

A. The sponsoring institution or consortium must be responsible for providing assurance that the activities assigned to students in the clinical setting are educational.

B. There must be documented ongoing communication between the sponsoring institution and its affiliates for exchange of information and coordination of the program.

II. RESOURCES

4. General Resources

Resources must support the number of students admitted into the program. The instructor to student ratio must be adequate to achieve the stated program goals.

5. Program Administration

A. Program Director

1. The program must have a qualified program director.

2. Responsibilities

   The program director must be responsible for the organization, administration, periodic review, planning, development, evaluation and general effectiveness of the program. The program director must have input into budget preparation and must be responsible for maintaining NAACLS approval of the program.

3. Qualifications

   The program director must be a clinical laboratory scientist/medical technologist who holds nationally recognized generalist certification and who has a master's or doctoral degree and three years of experience in clinical laboratory science education that includes teaching courses, conducting and managing learning experiences, evaluating student achievement, providing input into curriculum development, policy and procedure formulation, and evaluation of program effectiveness. The program director must have a

knowledge of education methods and administration as well as current accreditation and certification procedures.

4. Faculty Appointments

   The program director must have a faculty appointment at the sponsoring institution or must have a faculty appointment in each affiliated academic institution. In the case of a clinically based program, the program director's appointment at affiliated academic institutions may be a regular one, a non-salaried clinical or courtesy appointment, or an adjunct appointment, depending upon the regulations of the academic institution.

B. Advisory Committee

1. There must be an advisory committee composed of individual(s) from the community of interest (i.e. pathologists, other physicians, scientific consultants, academic professionals, administrators, practicing clinical laboratory scientists/medical technologists, practicing clinical laboratory technicians/medical laboratory technicians and other professionals) who have knowledge of clinical laboratory science education.

2. Responsibilities

   The advisory committee of the program shall have input into any aspect of the program/curriculum with regard to its current relevancy and effectiveness.

6. Faculty

The program must have qualified faculty (e.g., clinical laboratory scientists/medical technologists, administrators, managers and physicians).

A. Responsibilities

The faculty must participate in teaching courses, supervising applied laboratory learning experiences, evaluating student achievement, developing curriculum, formulating policy and procedures, and evaluating program effectiveness.

B. Qualifications

Faculty designated by the program must demonstrate adequate knowledge and proficiency in their content areas and demonstrate the ability to teach effectively at the appropriate level.

C. Professional Development

The program must assure and document ongoing professional development of the program faculty to assure that the faculty members are able to fulfill their instructional responsibilities.

7. Financial Resources

Financial resources for continued operation of the educational program must be ensured by an adequate, institutionally approved budget or by a statement of continued financial support from an executive officer of the sponsoring institution.

8. Physical Resources

A. Facilities

Classrooms, laboratories, administrative offices and other facilities must be adequate, equipped for safety, and must be in compliance with pertinent governmental laws.

B. Equipment and Supplies

Each student must have reasonable access to and experience with modern equipment and supplies.

C. Information Resources

Each student must have reasonable access to information resources containing current editions of books, periodicals and other reference materials in contemporary formats related to all content areas of the curriculum.

D. Instructional Resources

Adequate instructional resources must be available to facilitate each student's attainment of entry level competencies.

E. Computer Technology

Each student must have access to and experience with contemporary computer technology.

III. CURRICULUM

9. Curricular Requirements

A. Curricular Structure

Instruction must follow a plan which documents a structured curriculum composed of general education, basic sciences, and professional courses including applied (clinical) education. The curriculum must include clearly written program goals and competencies and course syllabi which must include individual course goals and objectives.

The curriculum must include all the major subject areas currently offered in the contemporary clinical laboratory. Behavioral objectives which address cognitive, psychomotor, and affective domains must be provided for didactic and applied (clinical practice) aspects of the program and must include clinical significance and correlation. Course objectives must show progression to the level consistent with entry into the profession.

B. Instructional Areas

The curriculum must include:

1. Scientific content (either prerequisite or as an integral part of the curriculum) to encompass areas such as anatomy/physiology, immunology, genetics/molecular biology, microbiology, organic/biochemistry, and statistics.

2. Pre-analytical, analytical, and post-analytical components of laboratory services, such as hematology, hemostasis, chemistry, microbiology, urinalysis, body fluids, molecular diagnostics, immunology, phlebotomy, and immunohematology. This includes principles and methodologies, performance of assays, problem-solving, troubleshooting, techniques, interpretation of clinical procedures and results, statistical approaches to data evaluation, and continuous assessment of laboratory services for all major areas practiced in the contemporary clinical laboratory.

3. Principles and practices of quality assurance/quality improvement as applied to the pre-analytical, analytical, and post-analytical components of laboratory services.

4. Application of safety and governmental regulations and standards as applied to laboratory practice.

5. Principles of interpersonal and interdisciplinary communication and team-building skills.

6. Principles and application of ethics and professionalism to address ongoing professional career development.

7. Education techniques and terminology sufficient to train/educate users and providers of laboratory services.

8. Knowledge of research design/practice sufficient to evaluate published studies as an informed consumer.

9. Concepts and principles of laboratory operations must include:
   a. Critical pathways and clinical decision making;
   b. Performance improvement;
   c. Dynamics of healthcare delivery systems as they affect laboratory service;
   d. Human resource management to include position description, performance evaluation, utilization of personnel, and analysis of workflow and staffing patterns, and;
   e. Financial management: profit and loss, cost/benefit, reimbursement requirements, materials/inventory management.

C. Learning Experiences

The learning experiences needed in the curriculum to develop and support entry level competencies must be properly sequenced and include instructional materials, classroom presentations, discussion, demonstrations, laboratory sessions, supervised practice and experience.

1. Student experiences must be educational and balanced so that all competencies can be achieved.

2. Student experiences at different clinical sites must be comparable to enable all students to achieve entry level competencies.

3. Policies and processes by which students may perform service work must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. After demonstrating proficiency, students, with qualified supervision, may be permitted to perform procedures. Service work by students in clinical settings outside of academic hours must be noncompulsory.

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be employed frequently enough to provide students and faculty with timely indications of the students' academic standing and progress and to serve as a reliable indicator of the effectiveness of instruction and course design.

IV. STUDENTS

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Students must be provided with a clear description of the program and its content and current publications, which must include:

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B. program goals and competencies;
C. course objectives;
D. applied education assignments (if applicable);
E. admission criteria, both academic and non-academic;
F. a list of course descriptions;
G. names and academic rank or title of the program director and faculty;
H. tuition and fees with refund policies;
I. causes for dismissal;
J. rules and regulations;
K. a listing of clinical facilities (if applicable),
L. essential functions, and
M. policies and procedures when applied experience cannot be guaranteed.

11. Admissions

Admission of students, including advanced placement if available, must be made in accordance with the clearly defined and published practices of the institution. Specific academic standards and essential functions required for admission to the program must be clearly defined, published and provided to prospective students and made available to the public. The signature of the student indicating full understanding of the policies for progression in the program and completion of the program must be secured.

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Rules and regulations governing acceptable personal and academic conduct must be defined and provided to all students upon entering the program.

13. Student Records

Student records must be maintained for admission, evaluation, and counseling or advising sessions. Individual grades and credits for courses must be recorded and permanently maintained by the sponsoring institution. The program must maintain

the student records, conforming to any governmental regulations and the regulations of any other accrediting agencies.

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There must be a procedure for determining that each applicant's or student's health will permit the individual to meet the written essential functions of the program. Students must be informed of and have access to the usual student health care services of the institution. The health and safety of students, faculty, and patients associated with educational activities must be safeguarded. Emergency medical care must be available for students while in attendance.

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Guidance must be available to assist students in understanding and observing program policies and practices, for advising on professional and career issues, and for providing counseling or referral for personal and financial problems that may interfere with progress in the program. Confidentiality and impartiality must be maintained in dealing with student problems.

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Appeal procedures must be distributed to students upon entering the program. They must include provisions for academic and non-academic types of grievances and a mechanism for neutral evaluation that ensures due process and fair disposition.

V. OPERATIONAL POLICIES

17. Fair Practices

A. Programmatic announcements must accurately reflect the program offered and include NAACLS' name, address and phone number.

B. Student recruitment and admission must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

C. Faculty recruitment and employment practices must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

D. Academic credits and costs to the student must be accurately stated, published, and made known to all applicants.

E. Policies and procedures for student withdrawal and refunds of tuition and fees must be published and made known to all applicants.

F. If more than one clinical laboratory science program is offered at an institution, the sponsoring institution must demonstrate that each program is being conducted to assure appropriate instruction for the students at the different educational levels.

G. The program must culminate in at least a baccalaureate degree or higher or in a certificate for the student who enters the program with a baccalaureate degree. The granting of the degree or certificate must not be contingent upon the student's passing any type of external certification or licensure examination. Academic standards for the program must be acceptable to the institution that grants the degree.

H. A written record of formal student complaints and resolution must be maintained.

I. Program evaluation information, including graduation, placement and any certification pass rates must be made available to NAACLS upon request.

VI. PROGRAM EVALUATION

18. Systematic Review

There must be a mechanism for continually and systematically reviewing the effectiveness of the program to include survey and evaluation instruments that incorporate feedback from a combination of students, employers, faculty, graduates, exit or final examinations, and accreditation review.

19. Outcome Measures

A review of outcomes measures (e.g. external certifying examination results, results from capstone projects) from the last three active years must be documented, analyzed and used in the program evaluation.

20. Graduation and Placement Rates

A review of graduation rates and placement rates must be documented, analyzed and used in the program evaluation.

21. Program Evaluation and Modification

The results of program evaluations must be documented and reflected in ongoing curriculum development and program modification, followed by an analysis of the effectiveness of any changes implemented.

VII. MAINTAINING ACCREDITATION

22. Program/Sponsoring Institution Responsibilities

Programs are required to comply with administrative requirements for maintaining accreditation, including:

A. Submitting the Self-Study Report, an Application for Continuing Accreditation, or a required Progress Report as determined by NAACLS;

B. Paying accreditation fees, as determined by NAACLS;

C. Informing NAACLS of relevant administrative and operational changes within 30 days. This includes changes in program official names, addresses or telephone numbers; affiliates, status (e.g., inactivity, closure) or location; and institution name;

D. Completing an Annual Report prescribed by NAACLS and returning it by the established deadline;

E. Verifying compliance with these Standards upon request from NAACLS, and;

F. Agreeing to a site visit date before the end of the period for which accreditation was awarded.

Standards of Approved Educational Programs for the Phlebotomist

The Standards of Approved Educational Programs
for the Phlebotomist
are published by the
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Adopted by the
National Accrediting Agency for Clinical Laboratory Sciences

Standards of Approved Educational Programs
for
Phlebotomy

PREAMBLE

OBJECTIVE

The purpose of these Standards and the Description of the Profession is to establish, maintain, and promote standards of quality for educational programs in the clinical laboratory sciences and to provide recognition for educational programs which meet or exceed the minimum standards outlined in this document.

The Standards are to be used for the development and evaluation of phlebotomy programs. Paper reviewers assist in the evaluation of the program's compliance with the Standards. Lists of approved programs are published for the information of students, employers, and the public.

DESCRIPTION OF THE PROFESSION

Phlebotomists are proficient in:

a. collecting, transporting, handling and processing blood specimens for analysis;
b. recognizing the importance of specimen collection in the overall patient care system;
c. relating the anatomy and physiology of body systems and anatomic terminology to the major areas of the clinical laboratory, and to general pathologic conditions associated with body systems;
d. identifying and selecting equipment, supplies and additives used in blood collection;
e. recognizing factors that affect specimen collection procedures and test results, and taking appropriate actions within predetermined limits, when applicable;
f. recognizing and adhering to infection control and safety policies and procedures;
g. monitoring quality control within predetermined limits;
h. recognizing the various components of the health care delivery system;
i. recognizing the responsibilities of other laboratory and health care personnel and interacting with them with respect for their jobs and patient care;
j. demonstrating professional conduct, stress management, interpersonal and communication skills with patients, peers and other health care personnel and with the public;
k. demonstrating an understanding of requisitioning and the legal implications of their work environment;
l. applying basic principles in learning new techniques and procedures;
m. recognizing and acting upon individual needs for continuing education as a function of growth and maintenance of professional competence.

Upon graduation and initial employment, the phlebotomist will be able to demonstrate entry level competencies in the above areas of professional practice. Refer to the NAACLS Phlebotomist Competencies.

REQUIREMENTS FOR APPROVAL

I. SPONSORSHIP

1. Institutional Affiliation

The sponsoring institution must provide post-secondary education. The sponsoring institution and affiliates, if any, must be accredited by a recognized national, regional or state agency.

In programs in which the education is provided by two or more institutions, responsibilities of the sponsoring institution and of each affiliate for program administration, instruction, and supervision must be described in writing and signed by both parties. All provisions of the agreement must be active with written documentation of the following items:

A. General
   1. Reason for agreement;
   2. Responsibilities of the sponsoring Institution;
   3. Responsibilities of the clinical affiliate, and;
   4. Joint responsibilities.

B. Specific
   1. Supervisory responsibilities for the students;
   2. Student professional liability coverage;
   3. Student health and safety policies;
   4. Provision for renewal,and ;
   5. Termination clause providing for program completion of enrolled students.

2. Acceptable Institutions

Approved programs must be established in:
A. colleges and universities;
B. hospitals and medical centers;
C. medical laboratories, and;
D. other post-secondary institutions or consortia that meet comparable standards for education in phlebotomy.

3. Sponsoring Institution's Responsibilities

Approval is granted to the institution that assumes primary responsibility for curriculum planning and selection of course content, coordinates classroom teaching and supervised applied education, appoints faculty to the program, receives and processes applications for admission, and grants the certificate documenting completion of the program.

A. The sponsoring institution or consortium must be responsible for providing assurance that the activities assigned to students in the clinical setting are educational.

B. There must be documented ongoing communication between the sponsoring institution and its affiliates for exchange of information and coordination of the program. A

meeting must be held at least annually between representatives of the sponsoring institution or consortium and the affiliates.

II. RESOURCES

4. General Resources

Resources must support the number of students admitted into the program. The instructor/student ratio shall be adequate to achieve the stated goals of the program.

5. Program Director

A. The program must designate a qualified program director.

B. Responsibilities

The program director must be responsible for the organization, administration, periodic review, planning, development, evaluation and general effectiveness of the program The program director must be responsible for maintaining NAACLS approval of the program.

C. Qualifications

The program director must hold a baccalaureate degree or higher and hold current certification by a nationally recognized agency for clinical laboratory science, or have formal training and current certification in phlebotomy. The program director must document continuing education hours (2.0 CEUs or 20 hours) in phlebotomy, clinical laboratory science, and/or education (including computer applications) within the previous two years. The program director must have knowledge of education and administration as well as current approval/certification procedures.

6. Faculty

The program must have qualified didactic and clinical faculty. (Didactic faculty are defined as instructors teaching the didactic components of phlebotomy. Clinical faculty are defined as instructors teaching the applied components of phlebotomy).

A. Didactic Faculty

1. Responsibilities

The faculty must participate in teaching courses, supervising applied laboratory learning experiences, evaluating student achievement, developing curriculum, formulating policy and procedures, and evaluating program effectiveness.

2. Qualifications

Didactic faculty must hold an associate degree or higher, or 60 college credit hours from an accredited institution, or an equivalent combination of education and experience with a minimum of 30 college credit hours and 3 years of relevant

teaching experience. They must also have current certification in phlebotomy or clinical laboratory science and document continuing education hours (2.0 CEUs or 20 hours) in phlebotomy, clinical laboratory science, and/or education (including computer applications) within the previous two years.

3. Professional Development

   The program must assure and document ongoing professional development of the program faculty to assure that the didactic faculty members are able to fulfill their instructional responsibilities.

B. Clinical Faculty

1. Responsibilities

   The clinical faculty must participate in instructing students during clinical experiences and evaluating student achievement.

2. Qualifications

   Clinical instructors must hold current certification in phlebotomy or clinical laboratory science, or have one year of full time phlebotomy experience.

7. Financial Resources

Financial resources for continued operation of the program shall be ensured by an adequate, institutionally approved budget or by a statement of continued financial support from an executive officer of the sponsoring institution.

8. Physical Resources

A. Facilities

Classrooms, laboratories, administrative offices and other facilities must be adequate, equipped for safety, and must be in compliance with pertinent governmental laws.

B. Equipment and Supplies

Each student must have reasonable access to and experience with modern equipment and supplies.

C. Library

Each student must have reasonable access to information resources containing current editions of books, periodicals and other reference materials in contemporary formats related to all content areas of the curriculum.

D. Instructional Resources

Adequate instructional resources (such as clinical, reference, demonstration materials)

must be available to facilitate each student's attainment of entry level competencies. Reference materials may include videotapes, computer tutorial materials, audio/visual resources, and/or other multimedia resources.

III. CURRICULUM

9. Curricular Requirements

A. Curricular Structure

Instruction must follow a plan which documents a structured curriculum, including applied education, with clearly written program goals and competencies and course syllabi which include individual course goals and objectives. Behavioral objectives which address cognitive, psychomotor, and affective domains must be provided for didactic and applied aspects of the program. Course objectives must show progression to the level consistent with entry into the profession and be cross-referenced to NAACLS Phlebotomist Competencies.

B. Instructional Areas

The curriculum must include instruction/experiences in the following:

1. 100 hours of applied experiences;
2. Performance of a minimum of 100 successful unaided collections;
3. Instruction in a variety of collection techniques, including vacuum collection devices, syringe and capillary/skin-puncture methods, and
4. Contact with various patient types, which may include varied clinical settings, such as health fairs, donor or pheresis centers, nursing home collection, in addition to the generally accepted inpatient and outpatient settings.

C. Learning Experiences

The learning experiences needed in the curriculum to develop and support entry level competencies must be properly sequenced and include instructional materials, classroom presentations, discussion, demonstrations, laboratory sessions, supervised practice and experience. NAACLS Phlebotomist Competencies must be used to design didactic and applied experiences.

1. Student experiences must be educational and balanced so that all competencies can be achieved.

2. Student experiences at different clinical sites must be comparable to enable students to achieve entry level competencies.

3. Policies and processes by which students may perform service work must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. After demonstrating proficiency, students, with qualified supervision, may be permitted to perform procedures. Service work by

students in clinical settings outside of regular academic hours must be noncompulsory.

D. Evaluations

Written criteria for passing, failing, and progression in the program must be provided. These must be given to each student at the time of entry into the program. Evaluation systems must be correlated to the objectives and competencies described in the curriculum for both didactic and applied components, and in all three domains. They must be employed frequently enough to provide students and faculty with timely indications of the students' academic standing and progress, and to serve as a reliable indicator of the effectiveness of instruction and course design.

IV. STUDENTS

10. Program Description/Publications

Students must be provided with a clear description of the program and its content and current publications, which must include:

A. program mission statement;
B. program goals and competencies;
C. course objectives;
D. applied education assignments (if applicable);
E. admission criteria, both academic and non-academic;
F. list of course descriptions;
G. names and academic rank or title of the program director and faculty;
H. tuition and fees with refund policies;
I. dismissal policies and procedures;
J. program rules and regulations;
K. list of clinical facilities (if applicable),
L. essential functions, and
M. policies and procedures of placement when clinical placement cannot be guaranteed outside of established eligibility criteria.

11. Admissions

Admission of students, including advanced placement if available, must be made in accordance with the clearly defined and published practices of the institution. Specific academic standards and essential functions required for admission to the program must be clearly defined, published and provided to prospective students and made available to the public. The signature of the student indicating full understanding of the policies for progression in the program and completion of the program must be secured.

12. Acceptable Conduct

Rules and regulations governing acceptable personal and academic conduct must be defined and provided to all students upon entering the program.

13. Student Records

Student records must be maintained for admission, evaluation, and counseling or advising sessions. Individual grades and credits for courses must be recorded and permanently maintained by the sponsoring institution. The program must maintain the student records, conforming to any governmental regulations and the regulations of any other accrediting agencies.

14. Health and Safety

There must be a procedure for determining that each applicant's or student's health will permit the individual to meet the written essential functions of the program. Students must be informed of and have access to the usual student health care services of the institution. The health and safety of students, faculty, and patients associated with educational activities must be safeguarded. Emergency medical care must be available for students while in attendance.

15. Guidance

Guidance must be available to assist students in understanding and observing program policies and practices, for advising on professional and career issues, and for providing counseling or referral for personal and financial problems that may interfere with progress in the program. Confidentiality and impartiality must be maintained in dealing with student problems.

16. Appeal Procedures

Appeal procedures must be distributed to students upon entering the program. They must include provisions for academic and non-academic types of grievances and a mechanism for neutral evaluation that ensures due process and fair disposition.

V. OPERATIONAL POLICIES

17. Fair Practices

A. Programmatic announcements must accurately reflect the program offered and include NAACLS' name, address and phone number.

B. Student recruitment and admission must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

C. Faculty recruitment and employment practices must be non-discriminatory in accordance with existing governmental regulations and the regulations of any other accrediting agencies applicable to the institution.

D. Academic credits and costs to the student must be accurately stated, published, and made known to all applicants.

E. Policies and procedures for student withdrawal and refunds of tuition and fees must be published and made known to all applicants.

F. If more than one clinical laboratory science program is offered at an institution, the sponsoring institution must demonstrate that each program is being conducted to assure appropriate instruction for the students at the different educational levels.

G. The program must culminate in a formal certificate or other award recognizing completion of the program. The granting of this award must not be contingent upon the student passing any type of external certification or licensure examination.

H. A written record of formal student complaints and resolution must be maintained.

I. Program evaluation information, including program completion, placement and any certification pass rates must be made available to NAACLS upon request.

VI. PROGRAM EVALUATION

18. Systematic Review

There must be a mechanism for continually and systematically reviewing the effectiveness of the program to include survey and evaluation instruments that incorporate feedback from a combination of students, employers, didactic faculty, clinical faculty, graduates, exit or final examinations, and approval review.

19. Outcome Measures

A review of outcomes measures (e.g. results from external certifying examinations and/or of capstone projects) from the last three active years must be documented, analyzed and used in the program evaluation.

20. Graduation and Placement Rates

A review of program completion rates and placement rates must be documented, analyzed and used in the program evaluation.

21. Program Evaluation and Modification

The results of program evaluations must be documented and reflected in ongoing curriculum development and program modification, followed by an analysis of the effectiveness of any changes implemented.

VII. MAINTAINING APPROVAL

22. Program/Sponsoring Institution Responsibilities

Programs are required to comply with administrative requirements for maintaining approval, including:

A. Submitting the Self-Study Report, an Application for Continuing Approval, or a required Progress Report as determined by NAACLS;

B. Paying approval fees as determined by NAACLS;

C. Informing NAACLS of relevant administrative and operational changes within 30 days. This includes changes in program official names, addresses or telephone numbers; affiliates, status (e.g., inactivity, closure) or location; and institution name;

D. Completing an Annual Report prescribed by NAACLS and returning it by the established deadline, and;

E. Verifying compliance with these Standards upon request from NAACLS.

Appendix G – Analysis of Program by Department Head and Dean

August 29, 2004

TO: Members of the Academic Program Review Committee

FROM: Ellen Haneline, Department Head CRHA

RE: Analysis of Medical Technology/Medical Laboratory Technology Programs

The Medical Technology and Medical Laboratory Technology programs are excellent programs, that have been struggling for enrollment during the past several years. Enrollment at the end of walk-in registration (August 27, 2005) shows that the number of students enrolled in the programs has increased over last year:

Program	F04 enrollment	F05 enrollment	% increase
Medical Technology	29	47	62%
Medical Laboratory Technology	8	13	162%
Phlebotomy	8	11	137%
Pre-Medical Technology	3	10	333%
Pre-Medical Laboratory Technology	2	9	450%

The increase in enrollment will present numerous issues for the programs. Each will be discussed below.

Future goals: Since the time of the last Academic Program Review, the overall goal of the program has been to increase its enrollment to an adequate level. The faculty have been active in promoting the program both on and off campus with the resultant increase shown in the table above. In an effort to attract student into the profession, a phlebotomy certificate program was developed and submitted for approval during the Winter semester, 2004. It was implemented in the Fall of 2004 in Grand Rapids, during the Winter 2005 semester in Big Rapids and is beginning in Gaylord in the Fall of 2006. Interest in the certificate program, especially in Northern Michigan has been very strong—the initial cohort for Gaylord is full at 12 students and there is a waiting list for the Winter 2006 start of the program.

During the Fall, 2005 semester, discussions will continue with hospitals and other employers in Northern Michigan regarding the implementation of a Medical Laboratory

Technology Program in the Fall of 2006. Initial discussions have indicated that there is a great need for highly trained and qualified individuals to fill current positions and those anticipated due to retirements. The equipment intensive nature of the program presents a challenge to its implementation of the program off campus.

Discussion of the feasibility of converting the courses in the final 2 years of the Medical Technology Program to an on-line format to provide an opportunity for individuals with an associate's degree in Medical Laboratory Technology to earn the bachelor's degree and sit for the higher level credentialing examination.

Adequacy of resource allocation: Sufficient resources have been allocated to the program. However, with the current increase in enrollment and the increased cost for supplies the program will be challenged to accommodate its needs during the current academic year. Increased enrollment will require that additional adjunct faculty are hired to meet the demand for classes. Qualified adjunct faculty are difficult to locate in the Big Rapids area and the university per hour rate is not attractive to faculty who are required to drive for an hour to more to campus to teach courses. Additional pressure on program resources comes from the dramatic increase in the cost of supplies over the past year. For example, the cost of supplies for the blood bank course has risen 8 times over the cost from last year. The program is heavily dependent upon donations of equipment and supplies to offset the budget allocation.

Perception of the relationship of the program to the FSU mission: The Medical Laboratory Technology and Medical Technology programs fulfill the mission of the university. They are career oriented, technically based programs that prepare individuals through a mix of general education and professional coursework for jobs in Michigan and throughout the United States.

Program's visibility and distinctiveness: The program is increasing its visibility throughout the state of Michigan by implementing off campus offerings. The faculty are highly visible in the professional community where they participate at the state and regional levels in the activities of the professional organization. Dan deRegnier has made several presentations at the national level.

The programs are distinctive in their structure. Students are able to begin their education in the phlebotomy certificate and proceed without loss of credit to the Medical Laboratory Technology program to earn an associate's degree and then to the Medical Technology Program to earn a bachelor's degree. The program at Ferris is the only program in the state that affords students this opportunity. Another distinctive feature of the program is its simulated laboratory which gives students laboratory experience prior to their assignment in the health care setting. The simulated laboratory has been used as a model by other programs.

The program is the only program in the northern lower peninsula.

Program's value: The programs provide highly educated practitioners to hospitals and other health care facilities in Michigan, the region and the nation. At a time when the number of practicing laboratory professionals is aging, they provide a source of new employees to fill the vacated positions.

In addition, the program provides value to the university by providing an alternate career path for students who are not accepted to either the Michigan College of Optometry or the College of Pharmacy. Students in pre-optometry or pre-pharmacy are generally able to complete degree requirements within a 2-year window because they have completed all of their science prerequisite courses.

Characteristics, quality and employability of students: The programs attract students who are interested in applied science. Each year, the program attracts 5-7 students were not accepted for admission into the Michigan College of Optometry or the College of Pharmacy. The average ACT score of for entering students for the past two years is 21.34. Students are primarily female, Caucasian and residents of Michigan.

100% of the graduates of the program who sought employment were employed in their field.

Quality of curriculum and instruction: As evidenced by the student's ability to pass national certification exams, employer feedback and feedback from internship site supervisors, the curriculum and instruction is of high quality. The program's students have had a 100% pass rate on national certification exams for many years. When surveyed, employers indicate that they prefer to hire graduates from the Ferris program over graduates from other programs within the state because the Ferris graduates are well prepared and able to function in the work setting with minimal orientation. Internship site supervisors indicate that they are pleased with the quality of the Ferris student's ability to adapt to the real-world setting.

Composition and quality of the faculty: At the present time, there are two faculty members assigned to the program. Both are masters prepared, long-time faculty members and adept at teaching their assigned courses.

Over the course of the past several years, with the decline in enrollment and retirement or resignation of faculty members, the number of faculty has declined. Clinical laboratory professionals are specialists in one of four general areas- Body Fluid Analysis, Blood Bank, Microbiology, and Clinical Chemistry. As faculty numbers have declined, the current faculty have adapted to teaching courses in all areas without loss of quality of instruction. If the increased enrollment is sustained and faculty are hired, individuals with expertise that complements the current faculty's will be sought.

As previously stated, locating and hiring adjunct faculty presents a challenge for the program.

Adequacy of facilities and equipment- The laboratory space assigned to the program is adequate to meet the needs of the currently enrolled students. The laboratories have sufficient equipment to accommodate 16 students per laboratory section. The laboratory space is heavily used by the programs--at the present time, the laboratory space is scheduled between 8 am and 7:50 pm four days per week. Minor cosmetic work needs to be done to improve the appearance of the laboratory space.

Continued growth will present challenges –at the current time, the number of students enrolled in each laboratory section is limited to 16 because of numbers of pieces of equipment. Because of the heavy use of the laboratory space, addition of equipment will be necessary to accommodate larger laboratory sections.