Maharishi University of Management, 1995 - 2019

MAHARISHI INTERNATIONAL UNIVERSITY

CS489

Applied Software Development:

Building Elegant Software Solutions
in Accord with Nature

PROFESSOR:

Obinna KALU, M.Sc., MSCS

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APPLIED SOFTWARE DEVELOPMENT:

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Professor: O. KALU, M.Sc., MSCS

SYLLABUS

"The human brain physiology is the hardware of that cosmic computer, which can create anything through proper programming."

—Maharishi

"Through repeated practice the programmer must gain complete familiarity with the basic instruction types on the quiet levels of inner consciousness, where his awareness is unbounded and is capable of comprehending all possible relationships and combinations of the basic instruction types. By having a thorough knowledge of the basic features of the programming language embedded at the fundamental level of the mind, a programmer can easily create a computer program to accomplish any task within the range of capability of the hardware."

"Enjoy your life and be happy. Being happy is of the utmost importance.
Success in anything is through happiness. More support of nature comes from being happy. Under all circumstances, be happy, even if you have to force it a bit to change some long-standing habits.

Just think of any negativity that comes to you as a raindrop falling into the ocean of your bliss. You may not always have an ocean of bliss, but think that way anyway and it will help it come. Doubting is not blissful and does not create happiness. Be happy, healthy, and let all that love flow through your heart."

"We have an infinite number of reasons to be happy and a serious responsibility not to be serious. Keep your desires turning back within and be patient. Allow the fulfillment to come to you. Gently resist the temptation to chase your dreams into the world. Pursue them in your heart until they disappear in the Self, and leave them there. It may take a little self-discipline.

Be simple, be kind, stay rested. Attend to your own inner health and happiness. Happiness radiates like a fragrance from a flower and draws all good things toward you. Allow your love to nourish yourself as well as others. Do not strain after your needs of life. It is sufficient to be quietly alert and aware of them. In this way, life proceeds more naturally, effortlessly.

Life is here to enjoy." -- Maharishi Mahesh Yogi

GOAL OF THE COURSE

Software Development is the systematic process of conceiving, specifying, analyzing, designing, programming, testing, documenting and maintaining involved in the production of some System or Application Software.

In this course, students will learn how to produce enterprise-grade Software solution, by taking requirements from conception through analysis, design, implementation and testing to delivery and deployment of working software. The course will teach a set of the core principles, best practices and the associated tools and technologies and how these are used and applied in the production of high-quality, robust software solutions. The techniques and tools covered will mostly be centered around, though not limited to, the Java software platform.

We will study the techniques for how to identify and elicit the correct requirements for a software product, how to analysis these requirements and select a suitable software solution architecture and create an appropriate design. And then, it will proceed to show how to implement the design in code, including testing and ultimately how to build and package the resulting artifact for delivery and deployment to production environment. We will consider various modern software deployment mechanisms, including use of Containers and the Cloud.

Topics will include:

- Object-Oriented Analysis and Design
- Domain modeling
- Database Design and Development
- Systems Architecture
- Web Application Development using Spring Web MVC
- System implementation and Testing; including Unit Testing, Mocking and Integration Testing
- Software Security – including Identity and Access Management
- Containerization and Container technologies

STUDENT LEARNING CHART

OBJECTIVES This is what you'll learn to do*	LEARNING ACTIVITIES This is how you'll learn it	ASSESSMENTS This is what will show you've learned it
1. Modeling an OO solution for a given software problem Domain (3,4,5,6,7)	By performing Domain modeling using various OOAD techniques	Results from exercises and lab assignments and Mid/Final Exam and Project
2. Implementing a given software design in Code, using appropriate software development environment and tools (3,4,5,6,7)	By setting-up suitable software development environment/tools and writing Code	Results from exercises and lab assignments and Mid/Final Exam and Project
3. Performing Testing for given software requirements	By identifying test-cases and implementing robust automated Unit and Integration testing using appropriate software testing framework and tools	Results from exercises assignments and Mid/Final Exam and Project
4. Presenting your work on a software development project to an audience	By preparing and giving a well-structured technical presentation in class	Results from In-Class Presentation exercises and Project presentation

*The numbers in parentheses refer to the MIU Essential Learning Outcomes that are best supported by this course objective. They appear in **boldface** in the list below.

1. *Development of consciousness*
2. *Health*
3. *Holistic thinking*
4. *Creativity*
5. *Critical thinking*
6. *Communication*
7. *Problem solving*
8. *Teamwork and leadership*
9. *Local and global citizenship*

UNIFIED FIELD CHART

(See the Unified Field Chart for Computer Science in the charts sub-folder of the Resources folder on the course website in Sakai – https://sakai.cs.miu.edu/)

OFFICE HOURS, CONTACT INFORMATION, AND BIOGRAPHICAL SKETCH

O. KALU

- Email: okalu@miu.edu
- Phone: 641-209-3393
- Office: McLaughlin Building – Room 110
- Office hours: Mondays - Saturdays (email for appointments)

Bio:
Professor Kalu has over 15 years of experience in the Software industry. In the 7 years from 2007 to 2014, he has worked as a Senior Software Engineer and Technical Lead on multiple enterprise software development projects for the United States government, including the US Department of Health and Human Services in Washington, DC.

Prior to that, he worked as a Software Developer at SAP AG, the world's largest business software company, where he was engaged in designing and implementing complex User Interface components for SAP's Retail industry software products, working extensively with Java AWT & Swing APIs. He joined the MIU faculty in 2017 and has so far, taught classes in Software Engineering, Web Application Programming and Modern/Fundamental Programming Practices, in the Masters in Computer Science (MSCS) program. And also, Modern Asynchronous Programming and Databases, in the Masters in Software Development (MSD) program.

His areas of interest include Software Engineering, Programming languages, Web Applications, Human-Computer Interaction and Artificial Intelligence. He also enjoys running, cycling, soccer, community service & volunteering.

TEXTS AND OTHER REQUIRED CLASS MATERIALS

Martin Fowler (2003) *UML Distilled, Third Edition*

Craig Walls (2022) *Spring in Action, Sixth Edition*

Craig Walls (2016) *Spring Boot in Action, First Edition*

Martin Fowler (2002) *Patterns of Enterprise Application Architecture, First Edition*

Personal Journal and Notes

CS489 – Applied Software Development - Course Overview chart

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week 1	Course Overview; **Lesson 1a**: Software development environment & tools	**Lesson 1b:** Software Build Automation	**Lesson 2:** Requirements and Domain modeling	**Lesson 3 & 4:** Application Platforms & Architecture	**Lesson 5a:** SQL Databases	**Lesson 5b:** NoSQL Databases: MongoDB
			Lab 2, Project Start	**Lab 3, Project**		
Week 2	Revision for Midterm	Midterm Exam	**Lesson 6** Data Persistence	**Lesson 6 cont'd:** Data Persistence	**Lesson 7:** RESTful Web APIs Devt	**Lesson 7 contd:** RESTful Web API Devt
	Study for Midterm	Midterm Exam Review	**Project**	**Project**	**Project**	
Week 3	**Lesson 8 & 9:** Full-stack Web Application Devt & Application Security	**Lesson 9 contd:** Application Security	**Lesson 10:** Containers & Containerization	**Lesson 11:** Software Testing	**Lesson 12:** Software Deployment	Revision for Final
	Project	**Project**	**Project**	**Project**	**Project**	
Week 4	Final Exam	Project	Project	Project	Project	Project Presentations
	Final Exam Review				Early-bird Project Presentations	Project Submission: [End of course celebration]

EVALUATION PLAN

Your class grade represents your performance on the course objectives as measured by class exercises, lab/homework assignments, course project execution and midterm and final exams, as well as your daily attendance and general professional etiquette.

What is the grade composed of?

Lab/Homework Assignments ..... 5 points

Quizzes ..... 5 points

Course Project ..... 20 points

Midterm Exam ..... 30 points

Final Exam ..... 40 points

Professionalism (Extra credit/Bonus point) +1.5 points

Total ..... 101.5 points

What do grades mean?

A+	97–100+	Highly Excellent	Meets the course objectives at an exceptionally high level
A	93–96+	Excellent	Meets the course objectives at a very high level
A-	90–92+	Very Good	Meets the course objectives at a high level
B+	87–89+	Good	Meets the course objectives at the expected level
B	83–86+	Fair	Meets the course objectives at the basic passing level
B-	80–82+	Needs improvement	Meets most of the course objectives
C+	77–79+	Needs improvement	Meets many of the course objectives
C	73–76+	Needs improvement	Meets some of the course objectives
C-	70–72+	Needs improvement	Meets some of the course objectives
NC	below 70	No credit	Does not meet the course objectives

DAILY SCHEDULE

On Monday–Friday, classes begin at 10:00 a.m. and end at 3:20 p.m. with an hour for lunch. On Saturdays, class meets from 10 AM to 12:30pm. For more detail, please see the recommended daily schedule below.

This daily schedule of all courses is designed to help you master specific fields of knowledge while also cultivating higher states of consciousness for success and fulfillment in life.

The more rested you are, the more you will learn. I recommend you aim to be in bed by 10:00 p.m., so you are rested and fresh each morning. If you have not finished your homework by then, then instead of staying up late to finish it, get a good night's rest and finish it in the morning before class.

You are also encouraged to participate in physical activity daily.

MORNING	
08:45 – 09:15 AM	Group meditation program for meditators and Sidhas
10:00 AM – 11:00 AM	Class lecture, discussion, activities, practicals etc.
11:00 – 11:10 AM	Stretch break
11:10 – 12:15 PM	Continuation of class lecture, discussion, activities, practicals etc.
12:15 – 12:30 PM	In-class group practice of the Transcendental Meditation program
12:30 – 1:30 PM	Lunch and walk
AFTERNOON	
1:30 – 2:30 PM	Continuation of class lecture, work on projects, in-class exercises, reading, lab assignments etc.
2:30 – 2:35 PM	Stretch break
2:35 – 3:00 PM	Continuation of class lecture, work on projects, in-class exercises, reading, lab assignments etc.
3:00 – 3:20 PM	In-class group practice of the Transcendental Meditation program for Meditators and Rising Sidhas
3:20 PM	End of class session

EVENING	
6:30 – 7:30 pm	Dinner
7:30 – 9:30 PM	Homework/Project (2 hours per evening)
9:30 PM	Rest

COURSE POLICIES

The following list of policies is meant to remind you of the policies in effect for this course. Most of these policies are University-wide policies that are explained in more detail in either the Student Handbook or the University Catalog's Academic Policy section, available online at https://students.mum.edu/student-handbook/ or https://students.mum.edu/catalogs . If you are unsure how a policy works, feel free to discuss it with me after class.

Development of consciousness component for each class

The Development of Consciousness component in each class includes:

- A 15-minute group meditation in the classroom before lunch, Monday–Saturday.
- At the end of class Monday–Friday:
    - **Meditators** stay for a 20-minute group meditation with class. This is part of each class — five group meditations per week. *Late minutes will be monitored for anyone who doesn't stay.*
    - **Sidhas** are excused at 2:45 pm to attend early or evening program in the Domes or flying halls on campus at least 5 times a week. This is part of the homework for each class.
- A group TM-checking before lunch sometime during the course.

All students are encouraged to do their 20-minute morning meditation each day before they come to class. One option is to attend the group meditation in Dalby Hall before breakfast. The 15-minute group meditation before lunch is a special bonus available to students here. Students who practice the TM-Sidhi program are encouraged to join group practice in the Golden Domes as often as possible.

Attendance

Students are expected to attend all class sessions. Much of the value of a university course comes from experiences you have in the class, which cannot be fully evaluated through quizzes, papers, or exams. For this reason, attendance is highly valued at MUM.

Absences may be categorized as excused or unexcused:

- An *excused absence* is defined as an absence due to illness or family emergency *or other circumstances beyond the student's control*. In this case, you are responsible for all readings and assignments whether you are able to attend class or not. In the interest of efficiency, please arrange to find out adjustments in assignments and other announcements from other classmates rather than from me, if possible. I will be happy to give you any handouts you missed while absent.
- All other absences are *unexcused*. Repeated unexcused absences are a violation of the MUM Code of Student Behavior. In addition to academic consequences, students with repeated unexcused absences are subject to disciplinary actions.

Contact me before class if you will be absent

- Please schedule appointments for outside of class time.
- In the rare event you must miss class or are sick, please contact me as soon as possible (contact information above) or send a message with a friend. If you keep me informed, I will know how you're doing and how to plan for each class.
- If you miss class without notifying me, I will assume the absence is unexcused.

Consequences of absences

- Unexcused absences may result in a reduction in your course grade by 3 percentage points for each session missed (morning or afternoon).
- If you miss more than 6 sessions of a standard 4-unit course, even for illness or family emergency, it's likely that you won't have completed enough of the coursework to be eligible for course credit. I may ask you to withdraw from the course.

Punctuality

Students are expected to arrive on time, just as in the professional world. We ask that you arrive a couple minutes early, so everyone is seated and settled when the class begins. Punctuality also extends to returning from lunch and breaks on time.

Consequences of arriving late or leaving early

A class grade may be reduced by one percentage point for every 20 cumulative minutes late (up to two points per session). This policy also applies to leaving class early.

NOTE — If you do arrive late, please look for the Attendance/Punctuality Registry posted in the classroom to record your late minutes (with academic honesty).

Turning in Assignments Late

Late homework (department policy) —Please do not turn in assignments after the end of the course without prior arrangement (see "Incomplete work" below).

"Incomplete work" at the end of the course

At the end of the course, I'll evaluate the work you've turned in according to the grading or evaluation plan announced at the start of the course. If you weren't able to complete assigned work by the end of the course *due to illness, family emergency, or other circumstances beyond your control*, you may petition me to turn in that work late for credit using a "Late Work Contract" (available at the Enrollment Center or downloadable from the MUM website – search "Late Work Contract.") For further details, please see the MUM Catalog under "Late Work Policy" in "General Policies."

Academic honor code

Personal integrity, honesty, and honor are essential qualities of a capable student, a good citizen, and a developing leader. Our Academic Honor Code sets forth the standards of academic honesty and personal integrity expected of all students for all writing assignments and exams. Abiding by the Academic Honor Code will also help you avoid questions of academic impropriety. For the full Honor Code, see the MUM Catalog and Student Handbook.

Computers, cell phones, and other devices

Please turn off all cell phones at the start of class, to avoid disruptions. We'll discuss when classroom use of computers is appropriate.

Promoting respectful classroom interaction

We enjoy a uniquely harmonious and supportive atmosphere at MIU. We honor diversity of every kind, including diversity of culture, ethnic, religion, race, gender and sexual orientation, and viewpoint. We do not tolerate racism, harassment, or abusive or disrespectful language or behavior. While we welcome all points of view, we ask that you maintain an open and supportive attitude toward your fellow classmates and university staff.

Standards of appearance

The MIU faculty seek to create a coherent, focused, and dignified atmosphere on campus and in the classroom that supports the giving and gaining of knowledge. We ask that you dress in keeping with this purpose. This means:

- Neat, dignified, and modest clothing appropriate to the occasion is encouraged at all times.
- Torn, stained, and sloppy clothing are not appropriate.
- Immodest or revealing clothing is not appropriate
- Shorts are not appropriate for class, but shorts (other than short shorts) may be worn in the dining hall or while doing class projects outside the classroom when appropriate as determined by the faculty.
- Students from other cultures and traditions are welcome to wear traditional dress, provided the appearance is neat and modest.

Dropping or withdrawing from a course

In the event that you need to withdraw from this course, the following policies apply. More details can be found in the *MIU Student Handbook*.

- If you drop the course by 4 PM of the second day of the course, you will not receive a grade, and the course will not appear on your transcript.

If you withdraw from the course *after* 4 PM of the second day of the course, you will need to pick up a Drop/Withdrawal Form from the Enrollment Center, fill it out, collect the appropriate signatures, and submit the completed form to the Enrollment Center.

If you live on campus, you will also need to meet with the Associate Dean of Students to discuss your plans for the block. It may also be advisable for you to speak with the Financial Aid Office to make sure that withdrawing will not adversely affect your financial aid award.

- If you withdraw from the course by 4 PM of the second Monday of the course, *and you turn in the required form with the required signatures*, you will receive a "W" grade on your transcript.
- If you need to withdraw from the course after 4 PM on the second Monday of the course, it must be for illness, family emergency, or other circumstances beyond your control, and you must have been otherwise passing the course at the time of the withdrawal. In this case, you will receive a "WH" grade on your transcript.

- If you stop attending the course but do not complete the required form for withdrawing, or if you miss the deadline for withdrawing, you will receive a grade of "NC".
- NOTE: *You may withdraw from only one course per semester*.

END-OF-COURSE FEEDBACK

Please give us your feedback about the course. Near the end of the course, you should receive an email from Mike Farrer, Director of Evaluation, that gives you a one-step login link. If you do not receive this email, you can request access by emailing Mike at evaluations@mum.edu or go to Smartevals.com/mum and log in there.

- Your Username: your student ID in 000-00-0000 format.
- Your Password: your birth date in MM/DD/YY format.

How it works

1. The information that you fill in on the online form is collected and sorted by an outside company, Gap Technologies
2. Gap Technologies prepares a report for each class that averages the numerical scores and lists your text responses anonymously.
3. Your instructor receives the report only after turning in grades. In other words, your comments remain anonymous.

We're committed to continuous improvement of the curriculum. We value and need your feedback.

SERVICES

Student Support Services

In addition to the normal support you'll receive from me and your classmates, you can take advantage of extensive on-campus support services for both academic and personal support you may need at any time.

To access these services, please stop by the Student Life department (Dreier 105) between 10 a.m. and 4 p.m., Monday–Friday, or call the department administrator at 641-472-1225 for referral to the appropriate person.

Writing Center

This is an especially valuable resource for all students, for anything you may be writing.

- Location — Arts Center room 112.
- Hours — Monday–Friday 3:30-6p.m. or by appointment.

To schedule a writing consultation, please stop by or email writingcenter@mum.edu. For questions, comments, concerns, or further information, please contact Ben McClendon at bmcclendon@mum.edu