MAHARISHI

UNIVERSITY OF

MANAGEMENT

### CS 544 – Enterprise Architecture

*The Field of All Possibilities is the Source of All Solutions*

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Joe Bruen

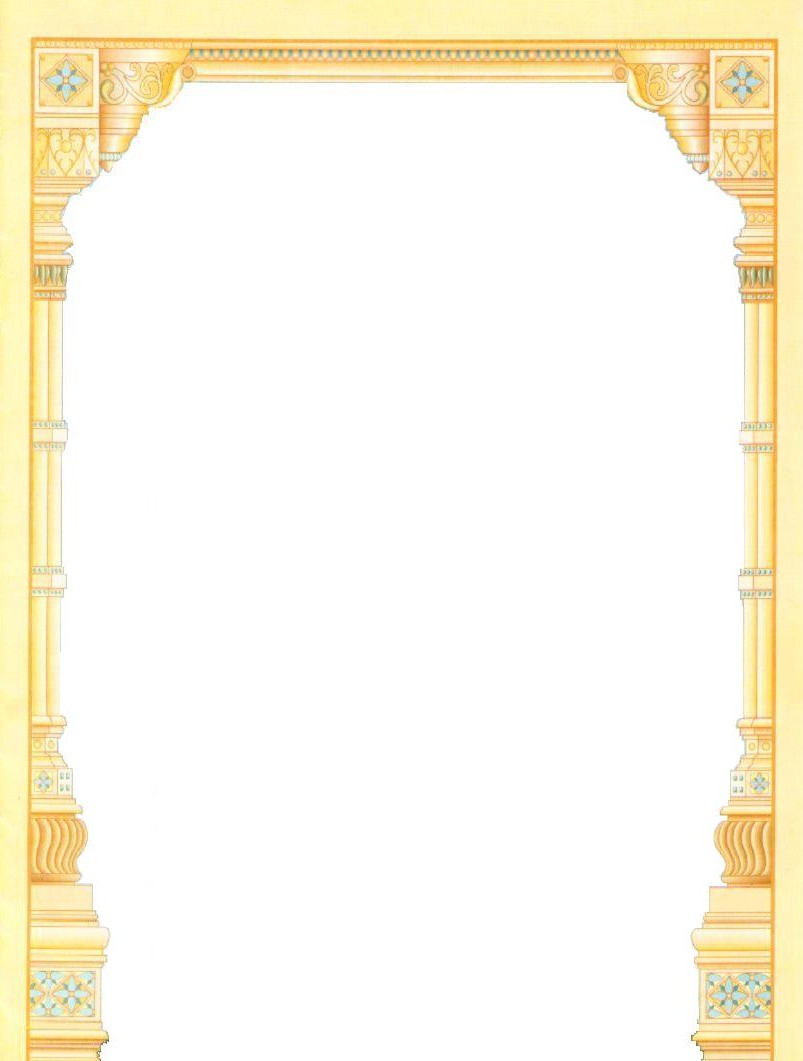
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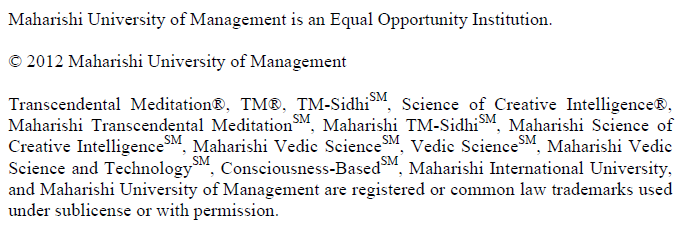
2019

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*Maharishi’s Twelfth Year of Invincibility*

*Global Raam Raj*





**CS544: Enterprise Architecture**

***Diversity Arising from Unity***

**Main Objectives of EA**

This course focuses on the protocols, principles, design patterns, and architecture of the Corporate Enterprise.  The course emphasizes principles and patterns that are general across all platforms and frameworks.

We will examine the architectural layers of an N-Tier architecture and the different technologies associated with these layers. The main emphasis will be what is commonly referred to as Service and Persistence tiers. Data Integrity, Security, Application Integration and Distributed Applications are areas of focus in this course.

To investigate these principles in depth the course will examine and work with the Spring Framework. The Spring Framework provides a comprehensive programming and configuration model for modern Java-based Enterprise Applications.

Also, in an Enterprise–level work environment, professional success is highly correlated with the ability to work in a team environment. In this course, we will develop team skills by organizing into groups of 3 or 4 at the start of the course. Teams will work as a unit, discussing course material, collaborating on labs and developing the course project.

CS-544: Enterprise Architecture

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Mon** | **Tues** | **Weds** | | **Thurs** | **Fri** | **Sat** |
| **Week 1**  **AM** | **Lesson 1**  Introduction to Enterprise Architecture &  Spring Core | **Lesson 2**  Introduction to ORM – Basic Mapping & Operations | **Lesson 3**  ORM  Associations | **Lesson 4**  ORM Basic Fetching & Concurrency | | **Lesson 5**  ORM Performance | **Review** |
| **PM** | **Lab** | **Lab** | **Lab** | **Lab** | | **Lab** |  |
| **Week 2**  **AM** | **EXAM** | **Lesson 6** Aspect Oriented Programming | Lesson 7 Enterprise  Spring & Enterprise Security | **Lesson 8**  Enterprise  Batch & Validation | | **Lesson 9**  Spring Integration: Remoting Technologies | Project Intro Review |
| **PM** |  | **Lab** | **Lab** | **Lab** | | **Lab** |  |
| **Week 3**  **AM** | Lesson 10 Enterprise Application Integration | **Lesson 11**  Spring MVC | **Lesson 12**  Web Services  OAuth2 | **Lesson 13**  Spring Boot  Microservices  NoSQL  & The Cloud | | **Review** | **EXAM** |
| **PM** | **Lab** | **Lab** | **Lab** | **Lab** | |  |  |
| **Week 4**  **AM** | Work on Final Project | Work on Final Project | Work on Final Project | Final Project Demos | |  |  |
| **PM** |

## *Course Objectives*

The following outlines the knowledge that you will gain, how you will attain it and how you will be evaluated.

|  |  |  |
| --- | --- | --- |
| What you will Learn | How you will learn | How you will be Assessed |
| Design OO-RDBMS applications based on Hibernate ORM (3,4,5) | * Lecture * Demo * Assigned Reading * Assigned Lab   Team collaboration  Individual submission   * Student-led review | * Quiz[daily]: self-Assessment * Exam #1 |
| Safely guard Enterprise Data through Security & Validation Technologies (3,4,5) | * Lecture * Demo * Assigned Reading * Assigned Lab   Team collaboration  Individual submission   * Student-led review | * Quiz[daily]: self-Assessment * Exam #2 |
| Integrate Distributed Technologies through Enterprise Integration (3,4,5) | * Lecture * Demo * Assigned Reading * Assigned Lab   Team collaboration  Individual submission   * Student-led review | * Quiz[daily]: self-Assessment * Exam #2 |
| Design distributed Functional N-tier architecture using RESTful Services (3,4,5) | * Lecture * Demo * Assigned Reading * Assigned Lab   Team collaboration  Individual submission   * Student-led review | * Quiz[daily]: self-Assessment * Exam #2 |
| Synthesize & Integrate the entire course content (3,4,5,6) | * Develop a Proof of concept application through a team-based project | * Presentation * Project Assessment |
| Connect Science of Consciousness and Technologies learned. (2,4) | * Individual Students reading aloud Main Points for daily lesson * Daily lecture augmented with fuller examples of technology & Consciousness relationships | * Essay questions on Exams * Writing an “original” main point in the daily status report |

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

1. Holistic development of consciousness and health
2. **Consciousness-Based understanding (Knowledge)**
3. **Creative and critical thinking**
4. **Communication**
5. **Scientific and quantitative reasoning**
6. Collaboration and leadership
7. Sustainable local and global citizenship

**Lesson Topics:**

**Lesson 1      Introduction to Course & Core Spring**

*N-tier architecture, Spring IoC & DI*

**Lesson 2      Introduction to ORM – Basic Mapping & Operations**

*OO Class to RBD table 7 Column, CRUD Srvices*

**Lesson 3      ORM Associations**

*Range of OO relationships, OneToOne, OneToMany…*

**Lesson 4      ORM Basic Fetching & Concurrency**

*JPQL, Transaction, Isolation \* concurrency*

**Lesson 5      ORM Performance**

*Fetching Stratgies, Cache strategies*

**Lesson 6      Aspect Oriented Programming**

*Cross cutting concerns*

**Lesson 7      Enterprise Spring & Security**

*Spring support of N-tier, Security Autehntication,Authoriztion,Access Control*

**Lesson 8    Enterprise Batch & Validation**

*Batch JSR 352 components, Integration of domain object validation through JSR 303/349*

**Lesson 9    Remoting Technologies**

*SOAP, JMS, AMQP*

**Lesson 10    Enterprise Integration**

*Enterprise Service Bus, EAI Pattern Components*

**Lesson 11    Spring MVC**

*Introduction to Spring Web UI Support*

**Lesson 12    Restful Web Services**

*Spring MVC & Jersey REST implementations & OAuth2*

**Lesson 13    Advanced Topics**

*Spring Boot, NoSQL, Cloud Deployment*

### Class Schedule

Class is in session from 10 AM to 12:30 every weekday morning, with the final 10 minutes devoted to a group meditation, and from 1:30 to 3:25 every afternoon, with the final 20 minutes for group meditation. On Saturday, we meet only in the morning and follow the usual weekday format during the morning.

### Textbooks

There is no specific ***required*** textbooks. The course material has drawn on numerous resources. Not in the least, the Spring Framework reference documentation as well as the Hibernate Reference Documentation. There is a ***suggested*** book with respect to Hibernate.

Suggested Textbooks

**Just Hibernate: A Lightweight Introduction to the Hibernate Framework**

by Madhusudhan Konda  
**ISBN:** 978-1-449-33437-6

O’Reilly Media; 1st edition (June 27, 2014)

**Readings**

The *recommended* text will supplement the material given in the lectures. You will find it helpful (and sometimes *necessary*) to read material from relevant sections in order to complete your understanding of the material and to assist you in doing the labs.

Below is a table that matches each lesson with a section from the book.

Recommended Reading:

|  |  |
| --- | --- |
| **Lesson Number** | **Corresponding Reading Material** |
| 1 | [Introduction to Spring IoC](https://docs.spring.io/spring/docs/current/spring-framework-reference/html/beans.html#beans-introduction) 1.1, 1.2.1; [Dependency Injection](https://docs.spring.io/spring/docs/current/spring-framework-reference/html/beans.html#beans-factory-collaborators) 1.4.1  [@Autowired](https://docs.spring.io/spring/docs/current/spring-framework-reference/html/beans.html#beans-annotation-config) 1.9,1.9.2; @[Component](https://docs.spring.io/spring/docs/current/spring-framework-reference/html/beans.html#beans-classpath-scanning) 1.10, 1.10.1, 1.10.2 |
| **Lesson Number** | **Corresponding Reading from Just Hibernate** |
| 2 | Chapters 1-3, Chapter 8 JPA  Also: [What is an ORM?](http://hibernate.org/orm/what-is-an-orm/) [Hibernate](http://hibernate.org/orm/) |
| 3 | Chapter 4, ,Chapter 5, Chapter 6 Inheritance -79-86 |
| 4 | Chapter 7 Hibernate Query Language |
| 5 | Chapter 6 Caching 77-79 |
| **Lesson Number** | **Corresponding Reading Material** |
| 6 | [Spring AOP](https://docs.spring.io/spring/docs/current/spring-framework-reference/html/aop.html) |
| 7 | [Spring Security Intro [2.1, 2.2]](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#introduction)  [Chapter 6.1, 6.2.1, 6.2.5, 6.4 Namspace](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#introduction-2)  [Chapter 16 Basic & Digest](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#basic) [Chapter 26.1, 26.3 Expression-based](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#el-access)  [NIST - RBAC](http://csrc.nist.gov/groups/SNS/rbac/) [ABAC](https://www.axiomatics.com/attribute-based-access-control.html) |
| 8 | Validation: [JSR 349 Preface](http://docs.jboss.org/hibernate/stable/validator/reference/en-US/html_single/#preface) [JSR 349 Chapter 2 Constraints](http://docs.jboss.org/hibernate/stable/validator/reference/en-US/html_single/#chapter-bean-constraints) [JSR 349 Chapter 5 Groups](http://docs.jboss.org/hibernate/stable/validator/reference/en-US/html_single/#chapter-groups)  [Spring Batch](http://docs.spring.io/spring-batch/reference/html/index.html) [Intro & Chapters 3&4] Chapter 7 |
| 9 | [Spring Remoting](http://docs.spring.io/spring/docs/current/spring-framework-reference/html/remoting.html#remoting) |
| 10 | [Spring Integration 3.1-3.4](http://docs.spring.io/spring-integration/reference/html/overview.html#overview) [Enterprise Integration Patterns](http://www.enterpriseintegrationpatterns.com/) |
| 11 | [Spring MVC](https://docs.spring.io/spring/docs/current/spring-framework-reference/htmlsingle/#mvc) [Spring MVC-getting started](https://spring.io/guides/gs/serving-web-content/) |
| 12 | [Understanding REST](https://spring.io/understanding/REST) [Spring Access RESTful Services](https://docs.spring.io/spring/docs/current/spring-framework-reference/htmlsingle/#rest-client-access)  [Jersey-REST](https://docs.oracle.com/cd/E19226-01/820-7627/6nisfjmk8/index.html) [OAuth2](https://projects.spring.io/spring-security-oauth/docs/oauth2.html) |
| 13 | [STS-Boot](https://spring.io/blog/2015/03/18/spring-boot-support-in-spring-tool-suite-3-6-4) [Microservices-Spring](https://spring.io/blog/2015/07/14/microservices-with-spring) |
|  |  |

Other Books:

Pro Spring, Spring Recipes & Pro Spring Security

**Homework**

I will assign Labs every day. In class I will give details concerning how status reports and lab assignments should be submitted. Even if you collaborate with others, make sure you understand and submit your own lab solution – because on the exams, the same concepts will reappear.

### Final Lab Project

During the final week of the course, you will work on a group project. The project will be presented on the last day of class.

### Exams

There will be two exams in the class. The following table provides additional details:

|  |  |  |  |
| --- | --- | --- | --- |
| **Exam Number** | **Date Administered** | **Exam Content** | **Value** |
| 1 | 2nd Monday | Lessons 1 – 5 | 35 % |
| 2 | 3rd Saturday | Lessons 6 - 13 | 50 % |

**Grading**

Your final grade will be a combination of your scores on Exams, Final Project, and Professional Etiquette, Labs and SCI. Combined Exam scores count 85%; Final Project scores for 10% ; Labs, SCI and your Professional Etiquette scores counts 5%. Professional Etiquette is an evaluation of your attendance,participation and professional appearance in class.

|  |  |
| --- | --- |
| **Evaluation Modality** | **Value** |
| Exams | 85% |
| Project | 10% |
| Professional Etiquette,SCI, Labs | 5% |

There will be extra credit awarded for participation in group meditation in Dalby Hall.We will use the following grading scale:

|  |  |
| --- | --- |
| Range | Letter Grade |
| 97-100  97-100  93 – 96  93 - 96 | A+H  A+  AH  A |
| 90 – 92  90 - 92 | A-H  A- |
| 87 - 89 | B+ |
| 83 - 86 | B |
| 80 - 82 | B- |
| 77 - 79 | C+ |
| 73 - 76 | C |
| 70 - 72 | C- |
| 0 - 69 | NC |