Liverpool John Moores University

Title: BUILDING AND STRUCTURAL MONITORING
Status: Definitive
Code: **7086BEPG**   (119561)
Version Start Date: 01-08-2013

Owning School/Faculty: Built Environment
Teaching School/Faculty: Built Environment

Team	Leader
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Academic Level: FHEQ7   **Credit Value:** 20.00   **Total Delivered Hours:** 51.00

Total Learning Hours: 200   **Private Study:** 149

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	33.000
Practical	13.000
Tutorial	2.000

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	UNSEEN EXAM	50.0	3.00
Test	AS2	IN-CLASS TEST	20.0	
Essay	AS3	2500 WORD ESSAY	30.0	

Aims

To develop the theoretical and practical skills required to design, develop and implement building and structural monitoring systems for applications within the built

environment.

Learning Outcomes

After completing the module the student should be able to:

1. Identify and understand the types of defects that occur in common building materials.
2. Critically appraise current methods for structural health and building performance monitoring and suggest improvements.
3. Understand the fundamentals of data processing, acquisition, storage and dissemination in order to apply this knowledge to the design of novel monitoring systems.
4. Critically evaluate available sensors in order to specify appropriate sensors and associated systems for given structural monitoring applications.
5. Evaluate the role of sensor networks for future monitoring applications within the built environment.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

EXAM   1   2

TEST   2

ESSAY   3   4   5

Outline Syllabus

Discussion of the underlying principles of structural (including buildings and infrastructure) health and building performance monitoring.

Introduction to the principles of sensing, the types of sensors available, their operational principles and the data available from them.

Detailed discussion of materials properties and defects for common building materials and also in disaster situations such as earthquakes, fires, floods, etc. Demonstrations of material performance will be included where appropriate, to show ramifications for buildings and infrastructure in such cases.

In-depth discussion of sensors (e.g. electromagnetic, optical fibres, strain gauges, etc.) which can be used for building or structure monitoring, with details of their characteristics and applicability to certain situations. How this will fit within the area of so-called future cities will be incorporated.

Sensors performance, characteristics, data acquisition, signal conditioning and data storage.
Wired and wireless networking standards for sensor systems.

Case studies pertaining to current structural monitoring systems and demonstrations of creating a structural health monitoring system in a given scenario to demonstrate the theoretical aspects outlined in the syllabus.
Insight into the future of structural health monitoring.

Learning Activities

Lectures, tutorials and demonstrations.

References

Course Material	Book
Author	Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes
Publishing Year	2006
Title	Structural Health Monitoring
Subtitle	
Edition	1st Edition
Publisher	Wiley-Blackwell
ISBN	1905209010

Course Material	Book
Author	Douglas Adams
Publishing Year	2007
Title	Health Monitoring of Structural Materials and Components
Subtitle	Methods with Applications
Edition	1st Edition
Publisher	Wiley
ISBN	9780470033135

Course Material	Book
Author	Feng Zhao and Leonidas Guibas
Publishing Year	2004
Title	Wireless Sensor Networks
Subtitle	An Information Processing Approach
Edition	1st Edition
Publisher	Elsevier
ISBN	1558609148

Course Material	Book
Author	Jon Wilson
Publishing Year	2004
Title	Sensor Technology Handbook
Subtitle	
Edition	1st Edition
Publisher	Elsevier
ISBN	0750677295

Course Material	Book
Author	Kim Kring
Publishing Year	2006
Title	LabView for Everyone
Subtitle	Graphical Programming Made Easy and Fun
Edition	3rd Edition
Publisher	Prentice Hall
ISBN	0131856723

Course Material	Book
Author	Gary Johnson
Publishing Year	2006
Title	LabVIEW graphical programming
Subtitle	
Edition	4th Edition
Publisher	McGraw-Hill
ISBN	0071451463

Notes

Students will be in introduced to the principles of building and structure monitoring, discussing very broadly why it is needed and why it has become a hot topic for the built environment. An in-depth look at the properties of materials, in respect of potential failure, will be considered alongside the application of a wide variety of sensing technologies for automated structural health monitoring. In particular, an insight into what happens to materials in extreme situations such as flooding, fires, earthquakes and what precautions are possible to prevent substantial damage will be provided. Building performance evaluation methods will be examined to highlight why it is different to Structural Health Monitoring. The module will include a significant demonstration aspect, taking the student through steps required to identify, design and construct a structural health monitoring system. Hands-on "interactive" sessions with students will introduce a number of common and newest types of sensors, where their operation in a supervised/guided way will be explored.