New College of the Humanities

Building Scalable Distributed Systems Course Descriptor

Course Title	Building Scalable Distributed Systems	Faculty	Philosophy
Course code	NCHCS767	Course Leader	TBA
Credit points	15	Teaching Period	Any
FHEQ level	Level 7	Date approved	September 2020
Compulsory/ Optional	Compulsory		
Pre-requisites	None		
Co-requisites	None		

COURSE SUMMARY

Scalability is an essential quality of modern, internet-facing systems. Specialised skills and knowledge are required to build systems that scale efficiently. This course covers the essential elements of distributed, concurrent computer systems. It builds upon that knowledge with engineering principles and practical experience with state-of-the-art technologies, methods and techniques for building scalable systems.

COURSE AIMS

The aims of this course are:

- Understand the necessity of building scalable distributed systems and key concepts related to scalability
- Build a distributed system that handles significant request loads and data volumes

LEARNING OUTCOMES

On successful completion of the course, students will be able to:

KNOWLEDGE AND UNDERSTANDING

K1d Understand advanced aspects of the theory and practice of building scalable software systems.

K2d Master practical methods and techniques for building scalable distributed systems.

K3d Evaluate the technical, management and social dimensions that underpin the development of scalable distributed systems (for availability, security, privacy and so on).

SUBJECT SPECIFIC SKILLS

S1d Critically assess scalability requirements and apply the appropriate engineering principles, methods and tools to build a scalable distributed system

S2d Become a sophisticated developer that can build high available, high performance and secure distributed systems based on best practice and industry standards.

S3d Build a working scalable distributed system.

TRANSFERABLE AND PROFESSIONAL SKILLS

T1d Critically review key developments in distributed systems and analyse the effectiveness of changes made to a computer system to scale

T2d Communicate effectively the available choices and trade-offs when building a scalable distributed system.

T2d Consistently apply an excellent level of technical proficiency in written English, using an advanced application of scholarly terminology, that demonstrates the ability to deal with complex issues both systematically and with sophistication.

T3d Develop software collaboratively in a team.

TEACHING AND LEARNING

Teaching and learning strategies for this course will include:

- 30 hours of full-cohort lectures
- 20 hours of lab-based tutorials
- 1 office hour per teaching week

There will be three 1-hour lectures per teaching week. Two 1-hour lab sessions will give students the opportunity to work on their assignments with the help of the course leader and teaching assistants.

Course information and supplementary materials are available on the College's Virtual Learning Environment (VLE).

Students will also attend the formal meeting, Collections, in which they will receive constructive and developmental feedback on their performance.

Students are required to attend and participate in all the formal and timetabled sessions for this course. Students are also expected to manage their directed learning and independent study in support of the course.

EMPLOYABILITY SKILLS

- Programming skills
- Communication skills
- Team-based project skills

ASSESSMENT

FORMATIVE

Students will be formatively assessed during the course by means of set assignments. These do not count towards the end of year results but will provide students with developmental feedback. Set assignments will also amplify problem-solving skills useful for the set exercises and develop software components that form part of the students' projects.

SUMMATIVE

Assessment will be in two forms:

AE:	Assessment Activity	Weighting (%)	Online submission	Duration	Length
1	Set exercises	50	Yes	N/A	Code and up to 2500-word explanation
2	Project	50	Yes	N/A	Code and up to 2500-word documentation

The set exercises and the project will be assessed in accordance with the assessment aims set out in the Programme Specification.

FEEDBACK

Students will receive formal feedback in a variety of ways: written (including via email correspondence); oral (within one-to-one tutorials or on an *ad hoc* basis) and indirectly through discussion during group tutorials.

Feedback is provided on summative assessment and is made available to the student either via email, the VLE or another appropriate method.

INDICATIVE READING

Note: Comprehensive and current reading lists for courses are produced annually in the Course Syllabus or other documentation provided to students; the indicative reading list provided below is used as part of the approval/modification process only.

BOOKS

Tim Peierls, Brian Goetz, Joshua Bloch, Joseph Bowbeer, Doug Lea, and David Holmes. 2005. Java Concurrency in Practice. Addison-Wesley Professional

George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair. 2011. Distributed Systems: Concepts and Design (5th. ed.). Addison-Wesley Publishing Company, USA

Martin Kleppmann. 2017. Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems. O'Reilly Media

INDICATIVE TOPICS

Students will study the following topics:

- Scalable data processing systems (e.g. Apache Hadoop, Spark and Flink)
- Designing and building scalable distributed systems
- Microservices
- Serverless architectures
- Replication, partitioning, and consistency in distributed systems
- NoSQL databases

Title: NCHCS767 Building Scalable Distributed Systems Course Descriptor

Approved by: Academic Board

Location: Academic Handbook/Programme specifications and Handbooks/ Postgraduate Programme Specifications/MSc Computer Science Programme Specification/Course Descriptors

Version number	Date approved	Date published	Owner	Proposed next review date	Modification (As per AQF4) & category number
2.0	January 2022	April 2022	Dr Alexandros Koliousis	April 2025	Category 3: Changes to Course Learning Outcomes
1.0	September 2020	September 2020	Dr Alexandros Koliousis	April 2025	