|  |  |
| --- | --- |
| **Course Title:** | Cloud Computing and Distributed Systems |
| **Course Code:** | **561CCN-3** |
| **Program:** | **Bachelor of Science in Computer Networks** |
| **Department:** | **Department of Computer Networks** |
| **College:** | **College of Computer Science and Information Systems** |
| **Institution:** | **Najran University** |

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# A. Course Identification

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. Credit hours: 3(2,2,1)** | | | |  | | | | | | | | | | | | |
| **2. Course type** | | | | | | | | | | | | | | | | |
| **a.** | University | |  | | College | | |  | Department | | | |  | Others |  |  |
| **b.** | | Required | | | |  | Elective | | |  |  | | | | | |
| **3. Level/year at which this course is offered:**  **Level 9** | | | | | | | | | | | |  | | | | |
| **4. Pre-requisites for this course** (if any)**:**  N/A | | | | | | | | | | | | | | | | |
| **5. Co-requisites for this course** (if any)**:** | | | | | | | | | | | | | | | | |
| **N/A** | | | | | | | | | | | | | | | | |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** | 3 | 100 |
| **2** | **Blended** |  |  |
| **3** | **E-learning** |  |  |
| **4** | **Distance learning** |  |  |
| **5** | **Other** |  |  |

**7. Contact Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Contact Hours** |
| **1** | **Lecture** | 30 |
| **2** | **Laboratory/Studio** | 30 |
| **3** | **Tutorial** | 15 |
| **4** | **Others** (specify) | 45 |
|  | **Total** | 120 |

# B. Course Objectives and Learning Outcomes

|  |
| --- |
| 1. Course Description Cloud is a model for distributed systems. Cloud computing has become the de facto platform on which enterprises are fueling digital transformations and modernizing IT portfolios. Today's Cloud systems are built using a common set of core techniques, design aspects, models and algorithms – all centered on distributed systems. This course provides an in-depth understanding of fundamental cloud and distributed computing concepts, terminology and its underlying theory, and algorithms. The concepts and models covered in course includes: virtualization, cloud and distributed networking, distributed algorithms, performance, scalability and privacy and security. Upon completing this course, students will have intimate knowledge about cloud computing and the underlying theory of distributed systems concepts work inside clouds. |
|  |
| 2. Course Main Objective |
| After completing the course student will be able to  #1 Define the basic concepts and terminologies of cloud computing and distributed systems.  #2 Explain various cloud and distributed systems paradigms including virtualization, types, models; cloud services; architecture and platforms design; infrastructure, file and storage systems, operating systems; security and privacy  #3 Evaluate the performance and different issues of cloud computing and distributed systems.  #4 Analyze the algorithms of cloud computing and distributed systems.  #5 Apply the knowledge and methods of cloud computing and distributed systems in programming. |

## 3. Course Learning Outcomes

| **CLOs** | | **Aligned****PLOs** |
| --- | --- | --- |
| 1 | **Knowledge and Understanding** |  |
| 1.1 | Define the basic concepts and terminologies of cloud computing and distributed systems | K1,K2 |
| 1.2 |  |  |
| 1.3 |  |  |
| 1... |  |  |
| **2** | **Skills :** |  |
| 2.1 | Evaluate the performance and different issues of cloud computing and distributed systems | S4 |
| 2.2 | Explain various cloud and distributed systems paradigms including virtualization, types, models; cloud services; architecture and platforms design; infrastructure, file and storage systems, operating systems; security and privacy | S6 |
| 2.3 | Analyze the algorithms of cloud computing and distributed systems. | S1,S6 |
| 2... | Apply the knowledge and methods of cloud computing and distributed systems in programming. | S5 |
| **3** | **Values:** |  |
| 3.1 |  |  |
| 3.2 |  |  |
| 3.3 |  |  |
| 3... |  |  |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Introduction to cloud computing and distributed systems | 4 |
| 2 | Cloud and distributed systems types, services and model | 4 |
| 3 | Cloud and distributed systems design platforms and architecture | 4 |
| 4 | Virtualization and virtual machine | 4 |
| 5 | Performance and benchmarks of cloud computing | 4 |
| 6 | Performance issues of distributed systems | 4 |
| 7 | Networks and protocol stacks, Client-server computing | 4 |
| 8 | Inter process communication; Sockets and remote procedure call | 4 |
| 9 | Cloud and distributed techniques and algorithms 1 | 4 |
| 10 | Cloud and distributed techniques and algorithms 2 | 4 |
| 11 | Cloud and distributed operating system | 4 |
| 12 | Cloud data integrity and distributed file system | 4 |
| 13 | Community clouds and ecosystems | 4 |
| 14 | Security and privacy issues in cloud and distributed Systems | 4 |
| 15 | Cloud and distributed systems programming | 4 |
| ... |  |  |
| **Total** | | 60 |

# D. Teaching and Assessment

## 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| **Code** | **Course Learning Outcomes** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- |
| **1.0** | **Knowledge** | | |
| 1.1 | Define the basic concepts and terminologies of cloud computing and distributed systems. | Lectures, Small Group Work, Small Group Discussion | Quiz 1,Midterm-1 Exam, Final Exam |
| 1.2 |  |  |  |
| … |  |  |  |
| **2.0** | **Skills** | | |
| 2.1 | Evaluate the performance and different issues of cloud computing and distributed systems. | Lectures, Small Group Work, Small Group Discussion | Midterm-1 Exam, Final Exam |
| 2.2 | Evaluate the performance and different issues of cloud computing and distributed systems. | Lectures, Small Group Work, Small Group Discussion | Midterm-1 Exam, Final Exam |
| 2.3 | Explain various cloud and distributed systems paradigms including virtualization, types, models; cloud services; architecture and platforms design; infrastructure, file and storage systems, operating systems; security and privacy | Lectures, Small Group Work | Midterm-2 Exam |
| 2.4 | Analyze the algorithms of cloud computing and distributed systems. | Lectures, Small Group Work, Small Group Discussion | Midterm-2 Exam, Final Exam |
| 2.5 | Apply the knowledge and methods of cloud computing and distributed systems in programming. | Lectures, Small Group Discussion, Lab Demonstrations | Lab Assignment, Lab Final Exam |
| **3.0** | **Values** | | |
| 3.1 |  |  |  |
| 3.2 |  |  |  |
| … |  |  |  |

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | Quiz and Assignment | 2 | 10 |
| **2** | Midterm Examination 1 | 5 | 15 |
| **3** | Midterm Examination 2 | 9 | 15 |
| **4** | Lab Activities | 8 | 10 |
| **5** | Lab Final Examination | 14 | 10 |
| **6** | Final Examination | 15 | 40 |
| **7** |  |  |  |
| **8** |  |  |  |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

|  |
| --- |
| **Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :** |
| . Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)    During the whole semester, 10 hours/week are reserved for students to guide them, to help them, to explain them topic which is not clear to them etc. |

# F. Learning Resources and Facilities

## 1.Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | 1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011 2. George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Distributed Systems Concepts and Design, fifth edition, Addison Wesley |
| **Essential References Materials** | 1. Distributed and Cloud Computing From Parallel Processing to the Internet of Things**,** Kai Hwang Jack Dongarra Geoffrey Fox; **ISBN:** 9780123858801, Morgan Kaufmann, October 2011 2. Andrew S. Tanenbaum, Maarten van Steen, Distributed Systems: Principles and Paradigms, second edition, Prentice Hall. 3. Graba, Jan, An Introduction to Network Programming with Java, second edition, Springer 4. Distributed Computing: Fundamentals, Simulations and Advanced Topics-Hagit Attiya and Jennifer Welch |
| **Electronic Materials** | Available in Blackboard |
| **Other Learning Materials** |  |

## 2. Facilities Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**  (Classrooms, laboratories, demonstration rooms/labs, etc.) | * Lecture Rooms with 20 seats with smart table, Mic, Speaker, PC, Auto Projector with Screen and a white board or a smart board (male Section). * IoT Lab. |
| **Technology Resources**  (AV, data show, Smart Board, software, etc.) | * Desktop/ Laptop computer Multimedia Projector * Laboratory contains an enough number of PC to accommodate all students with Java-related software like JCreator , J2SE , NetBean, Eclipse and JRE licensed version with network package should be installed. |
| **Other Resources**  (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | A File cabinet to keep class stuffs, papers and students files, and a printer to print program screen shots. |

# G. Course Quality Evaluation

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| **Evaluation**  **Areas/Issues** | **Evaluators** | **Evaluation Methods** |
| --- | --- | --- |
| Feedback about Course Learning Outcomes (CLOs) | Students, Faculty | Direct (A course survey is distributed to students to take their opinion) |
| feedback about the teaching strategies, assessment methods, textbooks, instructor | Students | Direct (A course survey is distributed to students to take their opinion) |
| feedback about the teaching strategies, assessment methods, textbooks, instructor | Faculty | Direct (Meeting with course coordinator and college coordinator periodically.) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

# H. Specification Approval Data

|  |  |
| --- | --- |
| **Council / Committee** |  |
| **Reference No.** |  |
| **Date** | January 19, 2019 |