

1. Course Number and Course Title:

COE 59404– Cloud Computing Infrastructure

2. Credits Hours:

3 – 0 – 3

3. Prerequisites and/or Co-Requisites:

Admission to MSCoE program.

4. Name and Contact Information of Instructor:

Dr. Raafat Aburukba

Office: EB1-202

Email: raburukba@aus.edu

Phone: (06)515-2956

Office Hours: as posted on *iLearn*; also by appointment.

5. Course Description (Catalog Description):

Covers advanced topics in cloud computing infrastructure, including: the role of cloud computing in applications such as smart cities, current practices, recent developments, and challenges in cloud computing infrastructure, cloud computing models and enabling technologies such as virtualization and web services, resource control and management, and current research topics.

6. Textbook and other Supplemental Material:

Textbook:

- Igor Faynberg, Hui-Lan Lu, Dor Skuler, Cloud Computing: Business Trends and Technologies, 2016, Wiley
- Sanjay Chaudhary, Gaurav Somani, Rajkumar Buyya, Research Advances in Cloud Computing, December, 2017, Springer

Other supplemental material:

- Research papers relevant to topics in cloud computing. Sample papers are as follows:
 - Khaled Metwally, Abdallah Jarray, Ahmed Karmouch, "A Distributed Auction-based Framework for Scalable IaaS Provisioning in Geo-Data Centers", IEEE Transactions on Cloud Computing, issue 99, 2018.
 - Alessio Botta, Walter de Donato, Valerio Persico, Antonio Pescapé, Integration of Cloud computing and Internet of Things: A survey, Future Generation Computer Systems, 56(2016), pp. 684-700, 2016.
 - Hiranya Jayathilaka ; Chandra Krintz ; Richard M. Wolski, "Detecting Performance Anomalies in Cloud Platform Applications", IEEE Transactions on Cloud Computing, issue 99, 2018.
 - Chia-Mu Yu ; Sarada Prasad Gochhayat ; Mauro Conti ; Chun-Shien Lu, "Privacy Aware Data Deduplication for Side Channel in Cloud Storage", IEEE Transactions on Cloud Computing, issue 99, 2018.
 - Chubo Liu, Kenli Li, Keqin Li, "A Game Approach to Multi-servers Load Balancing with Load-Dependent Server Availability Consideration", IEEE Transactions on Cloud Computing, issue 99, 2018.

- Zhou Zhou, Jemal Abawajy, Morshed Chowdhury, Zhigang Hu, Keqin Li, Hongbing Cheng and Abdulhameed A Alelaiwi, “SLA Violation and Power Consumption in Cloud Data Centers Using Adaptive Energy-aware Algorithms”, Future Generation Computer Systems, 2017.
- Thar Baker, Muhammad Asim, Hissam Tawfik, Bandar Aldawsari, Rajkumar Buyya, “An Energy-aware Service Composition Algorithm for Multiple Cloud-based IoT Applications”, Journal of Network and Computer Applications (JNCA), Volume 89, Pages: 96-108, ISSN: 1084-8045, Elsevier, July 2017.
- Chii Chang, Satish Narayana Srirama, and Rajkumar Buyya, “Mobile Cloud Business Process Management System for the Internet of Things: A Survey”, ACM Computing Surveys, Volume 49, No. 4, Article No. 70, Pages: 1-42, ACM Press, New York, USA, January 2017.

7. Learning Outcomes:

Upon completion of the course, students will be able to:

1. Understand the cloud computing building blocks and enabler technologies
2. Understand the role of cloud computing and its services in recent applications
3. Analyze cloud computing models
4. Design cloud computing data center using simulation tools
5. Analyze, model, and implement adequate scheduling techniques for cloud computing data centers
6. Explore cloud computing current practices and challenges
7. Conduct and present independent research in cloud computing

8. Teaching and Learning Methodologies:

Methods include lectures; problem and project based learning methods (simulations tools, and research paper, team project) and class discussions.

9. Course Topics and Schedule:

Topic	Weeks
Cloud computing models	1
Cloud computing role as an enabler paradigm in current applications such as smart cities	2
Cloud computing physical resources and virtualization techniques	2
Service oriented architecture and its importance to cloud computing	1
Fundamental control and management techniques in cloud data centers	1
Modeling techniques for cloud computing resource management	1
Scheduling techniques for single and multiple cloud data centers	2
Cloud Simulation Tool	1

Workflow modeling and orchestration	1
Current research issues and directions	2
Review and evaluations.	2
Total:	16

10. Schedule of Laboratory and other Non-Lecture

Sessions: Not Applicable

11. Out-of-Class Assignments with Due Dates:

Assignment	Due Date (tentative)
Homework 1	End of Week 3
Homework 2	End of Week 7
Homework 3	End of Week 9
Homework 4	End of Week 12
Submission of review paper 1	End of Week 5
Submission of review paper 2	End of Week 10
Final Project	End of Week 14

12. Student Evaluation:

Assessment	Weight	Due Date (tentative)
Midterm exam	15%	Week 7
Homework	15%	
Review papers	20%	
Course project	30%	Week 14
Attendance and participation	5%	
Final Exam	15%	As scheduled by Registrar

13. Contribution of Course to Student Outcomes

This course contributes to the accomplishment of the following program outcomes:

Students Outcome	Extent of Contribution
1. Perform research emphasizing creativity, independent learning and scientific methods in a chosen area of computer engineering	●
2. Apply advanced mathematics and engineering knowledge in identifying, formulating and solving engineering problems	○
3. Select and use techniques, skills and modern tools necessary for research or professional practice	●
4. Communicate effectively	○
5. Recognize the need for and engage in life-long learning	○

6. Attend to professional and ethical responsibilities	
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Extent of contribution: ● high; ◐ medium; ○ low