Detailed Syllabus
Lab-wise Breakup

NOTE: All the entries (…) must be in Times New Roman 11.

Course Code	17M15CS121	**Semester – DD Sum odd 22**	**Semester: DD9 Session: Sum** 2022 **Month from: June-July, 2022**
Course Name	**Cloud and Web Services Lab**		
Credits	1	**Contact Hours**	4 Hrs/Week Summer Sem

Faculty (Names)	**Coordinator(s)**	Janardan K Verma
	Teacher(s) (Alphabetically)	Janardan K Verma

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Demonstrate the architecture and layers of Cloud Service Models, Deployment models etc.	Understand (level 2)
CO2	Understand the working of CloudSim and run different scheduling alogorithms.	Apply (level 3)
CO3	Analyze various Scheduling algorithms and compare their performances	Analyze (level 4)
CO4	Apply and evaluate the performance of various Cloud based Web Services	Evaluate (level 5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	CloudSim installations and Use	Study of CloudSim, set up CloudSim environment, Virtual Machine (VM) creation, Running VMs on CloudSim.	CO1
2.		Allocate different Cloudlets to VMs and Data Centersusing different Cloud based scheduling algorithms	CO2
3.	Analyze various Scheduling algorithms in different scenarios on Cloudsim	Create different Data Centers, VM allocation and provisioning on Data Centers, and analysis of outcomes	CO3
4.		Assigning cloudlets and analysing the scheduling parameters for various scenarios	CO3
5.	Implement and Analyse Cloud Based Web Services	Apply and evaluate the performance of various Cloud based Web Services	CO4
n.	…	…	…

Evaluation Criteria

Components	**Maximum Marks**
Lab Test# 1	20
Lab Test# 2	20
D2D work	60
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Rajkumar Buyya, Rajiv Ranjan and Rodrigo N. Calheiros, Modeling and Simulation of Scalable Cloud Computing Environments and the CloudSim Toolkit: Challenges and Opportunities, Proceedings of the 7th High Performance Computing and Simulation Conference (HPCS 2009, ISBN: 978-1-4244-4907-1, IEEE Press, New York, USA), Leipzig, Germany, June 21 - 24, 2009.
2	Rodrigo N. Calheiros, Rajiv Ranjan, Anton Beloglazov, Cesar A. F. De Rose, and Rajkumar Buyya, CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms, Software: Practice and Experience, Volume 41, Number 1, Pages: 23-50, ISSN: 0038-0644, Wiley Press, New York, USA, January 2011.
3	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'REILLY publication.
4.	K. Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing- From Parallel Processing to the Internet of Things", Morgan Kauffman Publishers, Elsevier.
5.	
6.	
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Detailed Syllabus
Lab-wise Breakup

Course Code	17M15CS123	**Semester** II	**Semester** ... **Session** 2021-2022 **Month from** June to July, 2022
Course Name	**IoT Systems Development Lab**		
Credits	1	**Contact Hours**	2 Hours

Faculty (Names)	**Coordinator(s)**	Ms Amarjeet Kaur
	Teacher(s) (Alphabetically)	Ms Amarjeet Kaur Dr K.Rajalakshmi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C181.1	Explain Node-RED IDE platform for IoT application development and demonstrate I/O nodes, flows, third party palettes, import/export of flows in Node-RED.	Understand (level 2)
C181.2	Develop user defined functional nodes and deploy it in Node-Red.	Apply (level 3)
C181.3	Analyze various IoT Communication protocols using APIs with Arduino and Raspberry Pi along with sensors and actuators.	Analyze (level 4)
C181.4	Apply and evaluate the characteristics of different IoT devices.	Evaluate (level 5)
C181.5	Design and develop IoT based applications for various challenges and problems related to Sustainable Development, e.g., energy and waste management, water conservation, clean energy, improving public health, sustainable urbanization, smart agriculture etc.	Create (level 6)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Node-Red Installation and Use	Setup and Install Node.js and Node-RED as IDE platform for IoT application development.	CO1
2.		Demonstrate I/O nodes, flows, third party palettes, import/export of flows in Node-RED	CO1
3.		Develop Java Script based IoT applications using functional nodes , flows and dashboard on Node-RED platform	CO2
4.		Developing and implementation of user defined nodes for creating flows in Node-Red.	CO2
5.	Study and use of Arduino and Raspberry Pi, sensors and actuators.	Study and interface of Arduino and Rasberry Pi with different types of sensors and actuators	CO2
6.		Creation of various IoT based applications using Arduino and Rasberry Pi	CO3, CO4
7.	Developing IoT based systems applications using Arduino and Raspberry Pi	Developing smart applications for various challenges and problems related to Sustainable Development, e.g., energy and waste management, water conservation, clean energy, improving public health, sustainable urbanization, smart agriculture etc.	CO5

Evaluation Criteria

Components	**Maximum Marks**
Eval#1	10
Lab Test# 1	20
Eval#2	10
Lab Test# 2	20
Attendance	15
IoT System Development PBA	25
Total	**100**

Project based learning: Students form group of size 2-3 members. Each group will identify several real life issues in various thrust areas like healthcare, industrial, education, smart city, logistics, environment, governance and etc. Once problem has been identified, the group will analyze the problem and synthesizeIoT system based solutions to the identified problem. Each group will apply different IoTbased approaches such as smart sensor and heterogeneous devices. This approach will enhance skills of each student and increase the understanding of IoT systems in distributed applications. Moreover, candidate will gain the enough knowledge to provide the IoT solution to enhance the quality of life in human/organization. After this course, a student will able to undertake any work in this area in the industry or research.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Internet of Things: Architecture and Design Principles, Raj Kamal, McGrawHill.
2	"Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti
3	https://nodered.org/docs/getting-started
4.	https://www.arduino.cc/en/Tutorial/HomePage
5.	https://www.raspberrypi.org/documentation/

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS414	Semester Even (specify Odd/Even)	Semester: IX Session 2021 -2022 Month from February to June
Course Name	Agile Software Development Process		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Amarjeet Prajapati
	Teacher(s) (Alphabetically)	Dr Amarjeet Prajapati

COURSE OUTCOMES		COGNITIVE LEVELS
C433-10.1	Interpret the trade-offs between traditional and agile software development methods.	Understand level (Level 2)
C433-10.2	Apply appropriate agile software engineering approach for a software development.	Apply Level (Level3)
C433-10.3	Apply appropriate tools for testing agile projects using various testing strategies	Apply Level (Level3)
C433-10.4	Apply refactoring techniques on source code for improved design	Apply level (Level3)
C433-10.5	Estimation and monitoring of agile projects.	Analyze level (level4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Introduction	Traditional software development methods, Introduction to Agile software development methods and Agile development Frameworks. Lean software development	3
2.	Agile Fundamentals	Agile manifesto, Agile principles, Characteristics of Agile processes, an iterative development process, Pros and cons of incremental development and software prototyping.	3
3.	Scrum Framework	Introduction, Scrum - Prioritizing, Estimating, and Planning, The Scrum Experience (hands-on exercise)	5
4.	Extreme Programming (XP)	Extreme Programming Values, Principles and Practices, Pair programming, Embracing change, incremental change	5
5.	Crystal Framework	Crystal methodologies: project categories, complexity, family members, Crystal's seven properties, Crystal clear development process cycle, Crystal yellow, crystal orange and crystal orange web.	4
6.	Kanban Framework	The principles of Kanban, Improving process with kanban, Measure and manage flow, Emergent behavior	4
7.	Feature-Driven Development	Processes of feature driven development, practices and progress in FDD	2
8.	Refactoring in Agile	Bad smells in code, properties of refactoring, refactoring examples, benefits, cost and risk of refactoring	7
9.	Agile Testing	Agile testing strategy, Agile test plan, automated unit test, test driven development (TDD), alpha, beta and acceptance	5

		testing. Exploratory testing.	
10.	Estimation and Monitoring of Agile Projects	Agile estimation, Story point estimation, Sprint velocity estimation, team capacity, Planning and controlling agile projects.	4
		Total number of Lectures	42

Evaluation Criteria

Components	Maximum Marks
T1	30
End Semester Examination	40
TA	30 Attendance (10) + Assignment/Quiz/Mini-project (20)
Total	100

Project based learning: Each student in a group of 3-4 have to work on a mini-project, in which they will identify a real-life problem and develop the solution by applying their knowledge of search-based software engineering approach. The project implementation can be in any programming language preferably along with well documentation on different aspects of the software. It enhances the understanding of students towards different concepts of search-based software engineering approach and also helps them during their employability.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Cohn, Mike. Agile estimating and planning. Pearson Education
2.	Beck, Kent. Extreme programming explained: embrace change. Addison-wesley professional
3.	Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall.
4.	Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc.".
5.	Schwaber, Ken. Agile project management with Scrum. Microsoft press
6.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc."
7.	Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional

Detailed Syllabus
Lecture-wise Breakup

Subject Code	22B12CS422	**Semester: Integrated Summer Semester**	**Semester (Summer Semester),** **Session** 2022-23 **Month from:** June 2022 to July 2022
Subject Name	Cloud computing essentials: Azure and AWS		
Credits	**3**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Dr. Apeksha Aggarwal (J62)
	Teacher(s) (Alphabetically)	Dr. Apeksha Aggarwal (J62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-7.1	Examine the fundamentals of Cloud Computing, its applicability and architecture.	Understand (level 2)
C434-7.2	Examine the architecture and services of AWS (Amazon Web Services) cloud platform.	Analyze (level 4)
C434-7.3	Examine the architecture and services of Azure cloud platform.	Analyze (level 4)
C434-7.4	Examine the architecture and services of Google Cloud platform.	Analyze (level 4)
C434-7.5	Develop the applications using appropriate cloud platforms.	Apply (level 3)

Module No.	Subtitle of the Module	Topics in the Module	No. of Lectures for the module
1.	Overview of Cloud Computing	Origin of Cloud Computing, Benefits and challenges, Parallel and distributed computing, Grids and HPCs, Data center design and management for clouds, Virtualization: Why virtualization, Benefits and shortcomings, comparison with cloud, Software Defined Networks and Storage (SDN and SDS) Cloud Computing Architecture: IaaS, PaaS, SaaS, Types of cloud, Interoperability and its challenges, Cloud security, stability and fault tolerance methods and challenges, Applications for cloud, Clouds for different applications, Service Level Agreements, Concurrent, high-throughput and data intensive computing	10
2.	AWS Essentials	Introduction to Amazon Web Services, EC2: Compute services, Networking, infrastructure and reliability, Storage and database services, Amazon Elastic Block Store (Amazon EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Relational Database Service (Amazon RDS), Amazon virtual private cloud (VPC), Identity and Access Management (IAM) and Security on AWS.	8
3.	Azure Essentials	Azure core concepts, Azure services, Describe core solutions and management tools on Azure, Describe general security and network security features, Describe identity, governance, privacy, and compliance features, Describe Azure cost management and service level agreements.	8
4.	GCP Essentials	Google Cloud Fundamentals: Core Infrastructure-Google App Engine, Google Compute Engine, Google Kubernetes Engine, Google Cloud Storage, Google Cloud SQL, and BigQuery. Google Cloud Resource Manager hierarchy and Google Cloud Identity and Access Management , Essential Google Cloud Infrastructure: Foundation, Essential Google Cloud Infrastructure: Core Services, Elastic Google Cloud Infrastructure: Scaling and Automation, Reliable Google Cloud Infrastructure: Design and Process	8
5.	Recent trends, Cloud Platforms Comparison & Project based learning	Serverless computing, Microservices, Usage of containers and Dockers, Kubernetes, Comparing the services and efficiency of AWS, Azure and GCP with respect to resource management. Discussing and Implementing a few web applications and system applications on the cloud platforms under different resource management scenarios. Analyzing and evaluating the platforms based on various parameters like security, load balancing, fault tolerance, resilience, cost-effectiveness, etc.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
Mid Term	30
End Semester Examination	40
TA	30 (Attendance (10), Assignments (15) Quiz (5))
Total	**100**

Project based learning: Groups of 2-3 students will choose a project topic. They will use the concepts of cloud technology to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way. The knowledge gained will enhance their employability in the IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
	Text Books
1.	Cloud computing: principles and paradigms by Buyya, Raj kumar | Broberg, James Goscinski, Andrzej.
2.	Web applications on azure by Reagan, Rob.
3.	Building applications in the cloud: concepts, patterns, and projects
4.	Learning Amazon web services (AWS): a hands-on guide to the fundamentals of AWS cloud by Wilkins, Mark.
	Reference Books
1	Cloud computing bible by Sosinsky, Barrie | Shukla,G.D.
2.	Developing applications for the cloud: on the microsoft windows azure platform by Betts, Dominic | Densmore, scott | Dunn, Ryan
3	Cloud application architectures by Reese, George | Hill, Hattie.
4	Cloud data design orchestration, and management using Microsoft Azure by Diaz, Francesco.
5	https://docs.microsoft.com/en-us/learn/certifications/azure-fundamentals/

Research Methodology & Intellectual Property Rights (18M11GE111)

Basic idea of research, types of research, methods to write report and research papers, use of Mendeley in report writing, problem identification and solving, research ethics, patents, intellectual property rights, plagiarism regulation 2018, steps in research process and common methodologies to attempt solution to research paper, basic statistical concepts, handling of raw data, Some common probability distributions, hypothesis testing, parametric and non-parametric data, introduction to regression analysis.

Course Description

Course Code	**18M11GE111**	**Semester** Summer	**Semester** IX **Session** 2020-21 **Month from** June 2021 - July 2021
Course Name	Research Methodology & Intellectual Property Rights		
Credits	2	**Contact Hours**	2-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Himanshu Agarwal	
	Teacher(s) (Alphabetically)	Dr. Himanshu Agarwal, Prof. R. C. Mittal	

COURSE OUTCOMES:		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C101.1	explain the basic concepts and types of research	Understanding Level (C2)
C101.2	define a research problem, its formulation, methodologies and analyze research related information	Analyzing Level (C4)
C101.3	explain research ethics, understand IPR, patents and their filing related to their innovative works.	Understanding Level (C2)
C101.4	explain and analyzethe statistical data and apply the relevant test of hypothesis in their research problems	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Research	What is research? Types of research. What is not research? How to read a Journal paper?	3
2.	Report writing	How to write report? Use of Mendeley in report writing. How to write a research paper? Problem identification and solving.	4
3.	Ethics, IPR and Research	Research ethics, patents, intellectual property rights, plagiarism regulation 2018. Steps in research process and common methodologies to	8

	methodologies	attempt solution to research paper.	
4.	Basics of statistics and probability distributions	Basic statistical concepts. Handling of raw data, Some common probability distributions.	7
5.	Test of hypothesis and regression analysis	Hypothesis testing. Parametric and non-parametric data, Introduction to regression analysis.	8
		Total number of Lectures (Course delivery method: open ended discussion, guided self-study, lectures)	**30**

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Examination	30
End Semester Examination	40
Assignments	30 (Quiz, Assignments)
Total	**100**

Project based learning: Students divided in small groups will be assigned topics related to patents, intellectual property rights,plagiarism,and statistics.Students can write a report/review paper and find its similarity through plagiarism software available online. Students may collect data and test the relevant hypothesis.They may study some data set and do its regression analysis. The main purpose is to expose students to a wider arena of applicable knowledge of the subject.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Stuart Melville and Wayne Goddard, Research Methodology: An Introduction for Science & Engineering Students, Kenwyn, South Africa: Juta & Co. Ltd., 1996.

Kothari, C.R., Research Methodology: Methods and Techniques, New Age International, New Delhi, 2009.

Kumar, Ranjit, Research Methodology: A Step by Step Guide for Beginners, 2nd Edition, Sage Publications Ltd., 2005.

Ramappa, T., Intellectual Property Rights Under WTO, S. Chand, New Delhi, 2008.

Wayne Goddard and Stuart Melville, Research Methodology: An Introduction, Kenwyn, South Africa: Juta & Co, 2001.

Detailed Syllabus
Lab-wise Breakup

Course Code	**17M15CS122**	**Semester: Summer (specify Odd/Even)**	**Semester: 9th Session: INTSummer 2022** **Month** from June'22 to July'22
Course Name	Performance Engineering Lab		
Credits	**1**	**Contact Hours**	4 Hrs.

Faculty (Names)	**Coordinator(s)**	Dr. Manish K Thakur
	Teacher(s) (Alphabetically)	Dr. Manish K Thakur

COURSE OUTCOMES		**COGNITIVE LEVELS**
C176.1	Perform elementary mathematical and logical operations in Octave.	Apply (level 3)
C176.2	Create/Define single dimension / multi-dimension and perform basic operations on arrays, matrices and vectors.	Apply (level 3)
C176.3	Do basic image processing operations in Octave and compare performance w.r.t other languages.	Analyze (level 4)
C176.4	Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.	Analyze (level 4)
C176.5	Implement and analyze basic ML operations using Octave and Weka.	Apply (level 5)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Introduction	Perform elementary mathematical and logical operations in Octave	3
2.	Array Matrices etc.	Create/Define single dimension / multi-dimension and perform basic operations on arrays, matrices and vectors.	3
3.	Image analysis	Do basic image processing operations in Octave and compare performance w.r.t other languages.	4
4.	Plots and charts	Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.	3
5.	Machine Learning tools	Implement and analyze performance of Octave for basic ML operations like Linear Regression problem, Eigen Value extraction, SVD, PCA SGD etc.	4
6.	Weka Tool	Create/Define single dimension / multi-dimension and perform basic operations on arrays, matrices and vectors.	5

Evaluation Criteria

Components	**Maximum Marks**
Evaluation	25
Lab Test-1:	20
Lab Test-2:	20
Mini-Project:	20
Attendance:	15
Total	**100**

Project based Learning: Each student in a group of 3-4, will develop the mini-project related to the concepts learnt in this lab course. However, the developed project can be in any domain (like image processing, machine learning, algorithms, etc.), but Analyzing the performance of the developed project is essential.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	GNU Octave by Example: A Fast and Practical Approach to Learning GNU Octave by Ashwin Pajankar, and Sharvani Chandu, Apress, 2020
2.	GNU Octave Manual Version 3, by John W. Eaton, David Bateman, Søren Hauberg
3.	An Introduction to the WEKA Data Mining System by Zdravko Markov
4.	https://www.cs.waikato.ac.nz/~ml/weka/