Detailed Syllabus
Lecture-wise Breakup

Course Code	18M12CS115	**Semester (Even)**	**Semester II Session** 2019 -2020 **Month from Jan to June, 2020**
Course Name	Internet of Things		
Credits	**3**	**Contact Hours**	**3 Lectures**

Faculty (Names)	**Coordinator(s)**	Dr. Prakash Kumar
	Teacher(s) (Alphabetically)	1. Dr. K. Rajalakshmi 2. Dr. Prakash Kumar

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Identification of purpose, requirements and description of various components and specifications of IoT devices, applications and protocols.	Understand (level 2)
CO2	Develop the Process Model, Domain Model, Information Model and Service Model specifications using IoT communication protocols.	Apply (level 3)
CO3	Analyze the characteristics and functioning of various IoTspecific communication protocols used in different layers of IoT devices.	Analyze (level 4)
CO4	Evaluate various IoT protocols and components for building IoT applications for real world problems and sustainable solutions.	Evaluate (level 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Internet of Things	Introduction to Internet of Things, Layers in IoT, IoT Communication Protocols at different layers, Design steps for IoT, IoT Enabling Technologies, IoT Levels.	5
2.	IoT platforms design methodology	IoT Design methodology, Purpose and requirement specifications, Process, Domain, Information Model specifications, Service specifications and application development.	5
3.	IEEE 802.15.4	The Physical Layer, MAC Layer, MAC Layer Frame Format and their uses.	3
4.	ZigBee	ZigBee Architecture, Association, ZigBee Network Layer, APS Layer, ZDO, Security, ZCL etc.	3
5.	Internet Connecting Principles	Introduction to Arduino and Raspberry Pi, Connectivity with other components, internet connectivity, IP addressing in IoT, Media Access Control, and Application Layer Protocols: MQTT, CoAP, XMPP.	7
6.	Design Principles for Web Connectivity	Web Communication Protocols for Connected Devices, Message communication Protocols, Web connectivity : SOAP, REST, HTTP RESTFUL, Web Sockets	4
7.	Data Acquiring , Organizing, Processing and	Data Acquiring and Storage, Organizing the data, Transactions, Business Processes, Integration and Enterprises Systems, Analytics, Knowledge Acquiring,	4

	Analytics	Managing and Storing process	
8.	Data Collection, Storage and Computing using Cloud Computing	Cloud computing paradigms for Data Collection, Storage and Computing, Cloud Service Models, IoT Cloud-based Services.	6
9.	IoT Applications for Sustainable developments.	Energy Savings in IoT, Green IoT Applications developments for sustainability.	3
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Presentations of assigned topics)
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.	Internet of Things: A Hands-On Approach, ArshadeepBagha and Vijay Madisetti.
2	The Internet of Things: Key Applications and Protocols, Oliver Hersent, David Boswarthick, Omar Elloumi, Wiley.
3.	Internet of Things: Architecture and Design Principles, Raj Kamal, McGrawHill
4.	6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
5.	Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications, Daniel Minoli John Wiley & Sons

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M11CS121	**Semester** EVEN **(specify Odd/Even)**	**Semester M.Tech CSE (**IInd) DD (VIII) **Session** 2019 -2020 **Month from** January 2020 – June 2020
Course Name	**Cloud and Web Services Software Engineering**		
Credits	3-0-0	**Contact Hours**	…

Faculty (Names)	**Coordinator(s)**	Dr. Sandeep Kumar Singh
	Teacher(s) (Alphabetically)	…

COURSE OUTCOMES		**COGNITIVE LEVELS**
C113.1	Demonstrate role of Software engineering in combining cloud and web services computing paradigms for service development.	1. Understand Level (Level 2)
C113.2	Make use of web & cloud services and service engineering process to design, implement, and test, deploy and execute services.	2. Create Level (Level 6)
C113.3	Categorize various cloud services into compute, storage, database, application, analytics, network, and deployment.	3. Understand Level (Level 2)
C113.4	Analyze the requirements for developing and migrating applications to Web and Cloud Services.	4. Analyzing Level (Level 4)
C113.5	Appraise different design patterns, reference architectures, performance metrics, testing for Cloud and Web Services.	Evaluate Level (Level 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Distributed Software Engineering	Software Engineering Meets Services and Cloud Computing, Distributed Systems, Models of Interaction, Client and Server Computing, Architectural Patterns for distributed systems, Software as Service.	3
2.	Service-oriented software engineering	Service-Oriented Computing, Service-Oriented Architecture (SOA), Service Engineering and Service Composition	4
3.	Brief Introduction to XML	Structuring with XML- DTD, Schema.	3
4.	Introduction Web to Services	Brief of Web Services, Service Oriented Architectures, Core Functionality- SOAP, WSDL,UDDI, Microservices Architecture	6
5.	Designing and Implementing Services	Web Service Development Life Cycle, SOAP, Restful Services, Microservices – Domian Driven Design, Implementation, Deployment and Testing of Services	6
6.	Address SE in Web services	Web Services Design Pattern, Metrics to Measure Web Service Performance.	3
7.	Introduction to Cloud Services	Cloud Services, Cloud Deployment Models, Cloud Technologies and Open Source Software, Challenges - Scaling Computation, Scaling Storage, Multi-Tenancy, Availability, Limitations and Challenges in Cloud-Based Applications Development	6
8.	Cloud Services from Amazon	IAM services-users, groups, policy and roles, Elastic Compute Cloud, Databases on Amazon, Storage on Amazon services,	6
9.	Migrate, Secure and	Migration of Application to Web or Cloud Service, Enabling SSL	4

	Consume Services	authentication and authorization, consuming services using another service or application.	
10.	Address SE in Cloud services	Cloud Services Design Pattern, Metrics to Measure Cloud Service Availability, elasticity, Scalability, Load balancing, Auto scaling. Performance, Cloud Service Automation	6
		Total number of Lectures	**47**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
	Attendance = 07 Class Test/Quiz = 05 Internal assessment & Assignments in PBL mode = 13
Total	**100**

Recommended Reading material:

Text Books

1.	Mahmood Z, Saeed S (eds) (2013) Software Engineering Frameworks for the Cloud Computing Paradigm. Springer-Verlag, London
2.	Cloud Computing: A Hands-On Approach Book by Arshdeep Bahga and Vijay K. Madisetti, December 2013 CreateSpace Independent Publishing Platform7290 Investment Drive # B North Charleston SC United States
3.	Cloud Computing Design Patterns Book by Amin Naserpour, Robert Cope, and Thomas Erl, June 2015, Prentice Hall Press One Lake Street Upper Saddle River, NJ United States
4.	Software Engineering Book by Ian Sommerville Apil 2015, Pearson
5.	• Amazon Web Services for Mobile Developers: Building Apps with AWS October 2017, Abhishek Mishra, SYBEX Inc. 2021 Challenger Drive Alameda, CA United States
6.	• Web Services, Service-Oriented Architectures, and Cloud Computing, Second Edition: The Savvy Manager's GuideJanuary 2013, Douglas K. Barry, Morgan Kaufmann Publishers Inc. 340 Pine Street, Sixth Floor San Francisco CA United States

Reference Books

7.	• XML, Web Services, and the Data Revolution Book by Frank P. Coyle , March 2002, Addison-Wesley Longman Publishing Co., Inc.75 Arlington Street, Suite 300 Boston, MA,United State
8.	• Design Patterns: Elements of Reusable Object-Oriented Software with Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, 2003
9.	• Cloud Computing and Software Services Theory and Techniques Syed A hson and Dr. Mohammad Ilyas July 2010, CRC Press, Inc. Subs. of Times Mirror 2000 Corporate Blvd. NW Boca Raton, FL, United State

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17M11CS122	**Semester:** Even **(specify Odd/Even)**	**Semester** II **Session** 2019-2020 **Month from** Jan'20 **to** June'20
Subject Name	Performance Evaluation of Computing Systems		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Kavita Pandey
	Teacher(s) (Alphabetically)	Dr. Kavita Pandey

COURSE OUTCOMES		**COGNITIVE LEVELS**
C114.1	Demonstrate the ability to describe the correct tools and techniques for computer system performance evaluation	Understand (level 2)
C114.2	Identify the probability distribution in a given stream of data that corresponds to a source of randomness in a system.	Apply (level 3)
C114.3	Design the appropriate model of a discrete, dynamic, stochastic system using the theory of random processes.	Apply (level 3)
C114.4	Inspect the mathematical modeling techniques, Markov chains, queuing theory for analyzing the system.	Analyze (level 4)
C114.5	Select the appropriate experiments and perform a simulation study of the given system.	Evaluate (level 5)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Overview of Performance Evaluation	Need for Performance Evaluation, Systematic approach to Performance Evaluation, Selection of evaluation techniques and performance metrics	5
2.	Random Variables and Probability distributions	Discrete and continuous random variable, Expectation and variance, Bernoulli random variable, Binomial distribution, Poisson distribution, Geometric distribution, Normal and Exponential distribution, Normal approximation and Poisson approximation to binomial distribution, hazard rate function, , Comparing systems using sample data, Confidence interval	10
3.	Markov Process	Introduction and classification of stochastic processes, Discrete time and Continuous time markov chains, Birth and death processes , Transition probabilities, Steady state solution, Performance measure in terms of time spent and expected reward	6
4.	Queuing models	Basics of Queuing theory, Kendall notation, Little's Law, Analysis of a single queue with one server and multiple servers,	8

		Analysis of finite buffers queuing systems	
5.	Simulation modeling	Introduction to simulation, Types of simulation, Random number generation, a survey of random number generators, seed selection, testing random number generators , random variate generation	6
6.	Measurement techniques and tools	The art of data presentation, Ratio Games	2
7.	Experimental design and analysis	Types of Experimental designs, 2^2 factorial designs, General 2^K factorial designs, 2^{K-p} fractional factorial designs	5
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 07, Class Test, Quizzes, etc = 07, Internal assessment = 05, Assignments in PBL mode = 06)
Total	**100**

Recommended Text books:

1.	Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley, Reprint Edition, © 2014.
2.	K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd Edition, Reprint Edition, © 2018.

Recommended Reference books:

1.	Ross, Sheldon M. "A First Course in Probability". Upper Saddle River, N.J.: Pearson Prentice Hall, 10th Edition, ©2019
2.	Obaidat, Boudriga, "*Fundamentals of Performance Evaluation of Computer and Telecommunication Systems* ", 2010, Wiley, ISBN 978-0-471-26983
3.	Ross, Sheldon M. "Introduction to Probability Models". Amsterdam: Academic Press, 12th Edition, ©2019
4.	Fortier, Michel, "Computer Systems Performance Evaluation and Prediction", 2003, Elsevier, ISBN 1-55558-260-5

Detailed Syllabus
Lab-wise Breakup

Course Code	17M15CS121	**Semester** EVEN **(specify Odd/Even)**	**Semester** II **Session** 2019 -2020 **Month from** January 2020- June 2020
Course Name	Cloud and Web Services Lab		
Credits	2	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Dr.Sandeep Kumar Singh
	Teacher(s) (Alphabetically)	Dr. Sandeep Kumar Singh

COURSE OUTCOMES		**COGNITIVE LEVELS**
C179.1	Recall and show use of core OO concepts like classes, files, packages, modules, inheritance, exception handling and data structures.	Remembering Level (Level 1)
C179.2	Demonstrate creation, validation and parsing of well-formed XML documents using DTD and XML Schema	Understanding Level (Level 2)
C179.3	Design, Implement, Deploy and Test Services.	Create Level (Level 6)
C179.4	Make use of Amazon Web Services (AWS) from free tier.	Apply Level (Level 3)
C179.5	Construct simple applicationthat consume using both cloud and web services.	Create Level (Level 6)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Java Programming	Write programs in JAVA based on the concepts of classes, files, packages, modules, inheritance, exception handling and data structures.	CO1
2.	XML, DTD and XML Schema	Given a problem description of the scenario- design and validate DTD and XML Schema as well as XML documents	CO2
3.	XML, DTD and XML Schema	Given a problem description of the scenario- design XML Schema as well as XML documents	CO2
4.	XML DOM and SAX Parsers	Parse and check the validity of XML documents based on XML DTD as well as XML Schema	CO2
5.	Web Services	Design, Implement, Deploy and Test Services	CO3,CO5
6.	Web Services	Design, Implement, Deploy and Test Services	CO3,CO5
6.	Web Services	Design, Implement, Deploy and Test Services	CO3,CO5
7.	Amazon Web Services-IAM	Create AMAzon Account and Work with IAM services through Console Interface and Using Command Line SDK	CO4,CO5
8.	Amazon Web Services- EC2	Using AWS Console and Command Line Interface work with EC2 service of Amazon	CO4,CO5
9.	Amazon Web Services- VPC	Create and Configure VPC to manage high availability of resources.	CO4,CO5

10.	Amazon Web Services- Load Balancing	Create and Configure Load balancers to manage high availability of resources.	CO4,CO5
11.	Amazon Web Services- Autoscaling	Create and Configure Auto Scaling groups to manage high availability of resources.	CO4,CO5
12.	Amazon Web Services- Monitoring	Create and Configure Resource Groups, Cloud Watch and TCO to monitor and measure the resource usage.	CO4,CO5
13.	Application Design	Create and Implement Application based on Cloud and Web Services	CO6

Evaluation Criteria

Components	**Maximum Marks**
LT120	
LT2 20	
Attendance	15
Web & Cloud Service PBA 30	
Report of Project	15
Total	**100**

Recommended Reading material:

Text Books

1.	Mahmood Z, Saeed S (eds) (2013) Software Engineering Frameworks for the Cloud Computing Paradigm. Springer-Verlag, London
2.	Cloud Computing: A Hands-On Approach Book by ArshdeepBahga and Vijay K. Madisetti, December 2013 CreateSpace Independent Publishing Platform7290 Investment Drive # BNorth CharlestonSCUnited States
3.	Cloud Computing Design Patterns Book by Amin Naserpour, Robert Cope, and Thomas Erl, June 2015, Prentice Hall PressOne Lake Street Upper Saddle River, NJUnited States
4.	Software Engineering Book by Ian SommervilleApil 2015, Pearson
5.	• Amazon Web Services for Mobile Developers: Building Apps with AWSOctober 2017, Abhishek Mishra, SYBEX Inc. 2021 Challenger Drive Alameda, CA United States
6.	• Web Services, Service-Oriented Architectures, and Cloud Computing, Second Edition: The Savvy Manager's GuideJanuary 2013, Douglas K. Barry, Morgan Kaufmann Publishers Inc. 340 Pine Street, Sixth Floor San Francisco CA United States

Reference Books

7.	XML, Web Services, and the Data Revolution Book by Frank P. Coyle , March 2002, Addison-Wesley Longman Publishing Co., Inc.75 Arlington Street, Suite 300 Boston, MA,United State
8.	Design Patterns: Elements of Reusable Object-Oriented Software with Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, 2003
9.	Cloud Computing and Software Services Theory and Techniques Syed A hson and Dr. Mohammad Ilyas July 2010, CRC Press, Inc. Subs. of Times Mirror 2000 Corporate Blvd. NW Boca Raton, FL, United State

Detailed Syllabus
Lab-wise Breakup

Course Code	**17M15CS122**	**Semester Even (specify Odd/Even)**	**Semester 2nd Session** 2019 -2020 **Month from Jan'20 to June'20**
Course Name	Performance Engineering Lab		
Credits	**2**	**Contact Hours**	2 hrs

Faculty (Names)	**Coordinator(s)**	Dr. Kavita Pandey
	Teacher(s) (Alphabetically)	Dr. Kavita Pandey

COURSE OUTCOMES		**COGNITIVE LEVELS**
C174.1	Experiment with GProf to calculate the performance and statistics of a program in terms of call counts and timing information of functions.	Apply (level 3)
C174.2	Compare the performance of different protocols by simulating various network scenarios in NS2 Simulator.	Analyze (level 4)
C174.3	Design wired and wireless networks in NS2 and analyze the simulation results using AWK and Python programming.	Apply (level 3)
C174.4	Examine the performance of M/M/1, M/D/1 and D/M/1 Queuing models in NS2.	Analyze (level 4)
C174.5	Utilize the Weka Tool for analyzing data file.	Apply (level 3)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	GNU Profiler	Use the Gprof (GNU Profiler) to analyze the performance and statistics of a program	1
2.	Network Simulator	Introduction to Network simulator (NS2) and exploring it's utilities NAM, XGraph etc.	2
3.	Wired Network Simulation	1. Creation of Wired Network Scenarios 2. Exploring the various Traffic Applications with the nodes and introduction of wired Trace file 3. Wired Network Performance Analysis using AWK and Python	3
4.	Queuing Analysis	1. Simulation of various queues in NS2 and analyzing their performances on various performance metrics such as throughput, average delay and packet loss 2. Simulation of various queue Scheduling Algorithms	4
5.	Analysis of Wireless Routing Protocols	1. Creation of wireless network scenarios and simulation of various wireless routing protocols 2. Analysis of wireless trace file using AWK and Python	3
6.	Weka Tool	Performance analysis of data file using WEKA tool	5

Evaluation Criteria	
Components	**Maximum Marks**
Evaluation-1:	10
Lab test-1 :	20
Lab test-2 :	20
Evaluation-2 :	15
Project:	20
Attendance:	15
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.	GPROF Tutorial – How to use Linux GNU GCC Profiling Tool
2.	Marc Greis' Tutorial for the UCB/LBNL/VINT Network Simulator "ns"
3.	Introduction to Network Simulator NS2 by Teerawat Issariyakul, Ekram Hossain
4.	An Introduction to the WEKA Data Mining System by Zdravko Markov
5.	https://www.cs.waikato.ac.nz/~ml/weka/
6.	nile.wpi.edu/NS/
7.	The ns Manual, https://www.isi.edu/nsnam/ns/doc/ns_doc.pdf

Detailed Syllabus

Project Based Learning I (17M17CS111**)**
M.Tech CSE II Semester
Lab-wise Breakup

Subject Code	17M17CS111	**Semester** **Even**	Semester _II __ Session 2019-20 Month: from Jan To June 2020
Subject Name	Project Based Learning I (17M17CS111) Open Source Software Development		
Credits	**2**	**Contact Hours**	**0-0-4**

Faculty (Names)	**Coordinator(s)**	Dr. Taj Alam
	Teacher(s)	Adwitya Sinha, Taj Alam & Vikas Saxena

COURSE OUTCOMES: At the completion of the course, students will be able to

S.NO	DESCRIPTION	COGNITIVE LEVEL (BLOOMS TAXONOMY)
CS211.1	Conduct literature review to compare and contrast their project with existing work in the area and prepare a project proposal to be delivered to their peers and faculty members	Understanding Level (Level II)
CS211.2	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	Understanding Level (Level III)
CS211.3	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	Analyzing Level (Level II)
CS211.4	Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline	Applying Level (Level IV)
CS211.5	Appraise by giving milestone presentations to their peers and faculty about their current progress.	Evaluating Level (Level V)
CS211.6	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	Creating Level (Level VI)

Course Description:

Module No.	**Subtitle of the Module**	**Topics in the module**	**CO**

1.	Conduct literature review	Conduct literature review to compare and contrast their project with existing work in the area and prepare a project proposal to be delivered to their peers and faculty members	CO1
2.	Role Mapping	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	CO2
3.	Coordination	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	CO3
4.	Submit Project Development Timeline	Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline	CO4
5.	Presentation	Appraise by giving milestone presentations to their peers and faculty about their current progress.	CO4
6.	Prepare technical report	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	CO5

Evaluation Criteria

Components	**Maximum Marks**
Fortnightly Assessment	40
Peer Group Evaluation	10
Self Assessment by Student	10
Viva Voce at the end of semester	20
Semester End Presentation	10
Report at the end of semester	10
Total	**100**