

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	14M1NCI231	<b>Semester</b> 2 <sup>nd</sup> Sem <b>(Even)</b>	<b>Semester</b> MTech & Intg. CSE <b>Session</b> 2018 -2019 <b>Month from</b> Jan to May
<b>Course Name</b>	Cryptography and Computer Security		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Gagandeep Kaur
	<b>Teacher(s) (Alphabetically)</b>	Dr. Gagandeep Kaur

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Understand principles & theories of cryptography and computer security; Classify symmetric encryption techniques	Understand Level (Level 1)
<b>CO2</b>	Apply the knowledge of number theory in public key cryptographic techniques	Apply Level (Level 2)
<b>CO3</b>	Analyze security mechanisms using rigorous approaches, including theoretical for intrusion detection systems	Analyze Level (Level 3)
<b>CO4</b>	Evaluate Authentication Techniques and Hash Algorithms	Evaluate Level (Level 4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Introduction to principles and theories of cryptography and computer security, Network security protocols at different layers with respect to TCP/IP security protocol stack, namely, FTPS, HTTPS, DNSSEC, SSL, SSH, SMIME,	4
2.	IPSec	IPSEC (IP Security – IP Authentication Header, Payload Encapsulation) and PPTP	4
3.	Vulnerabilities & Solutions	Techniques and approaches to discover network and system vulnerabilities. Unwanted traffic, Firewalls, VPNs, Intrusion Detection, filters, Protocol weakness exploits, malware vulnerabilities, Spams, Defensive solutions: Packet filtering, Attack Classification and Vulnerability Analysis, Detection, Containment and Response/Recovery	6
4.	Security Tools	Tools for improving system security, Security, Secure Socket Layer and Secure Electronic Transaction.	2
5.	Network Attacks & Classification	Implementation of supervised & unsupervised defensive solutions based on packet filtering, attack classification & vulnerability analysis, detection and mitigation.	3
6.	Cryptography Basics	Mathematics of Cryptography: Modular Arithmetic, Congruence and Matrices, Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm Requirements	4

		for Cryptography, Cryptanalysis and attacks	
7.	Symmetric Ciphers	Mathematics of Symmetric-Key Cryptography: Algebraic Structures, Conventional Symmetric Encryption Algorithms Symmetric vs Asymmetric Block and Stream ciphers, DES: DES Structure & DES Security, Double and Triple DES	8
8.	Asymmetric Ciphers	Cryptographic Modes Public Key Cryptography Principles & Applications Algorithms RSA, Diffe-Hellman Key Exchange, DSS Elliptic-curve, Stream Cipher: RC4 and RC5.	8
9.	Data Integrity	One way Hash Functions Message Digest MD5,SHA1 Digital Signatures Public Key Infrastructure (PKI) Digital Certificates Certificate Authorities	4
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments + Attendance)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Cryptography & Network Security, Forouzan, Tata McGraw Hill
2.	Botnets: The Killer Web App, Craig A. Schiller, Jim Binkley, David Harley, Gadi Evron Tony Bradley, Carsten Willems, Michael Cross, Syngress
3.	Cryptography and Network Security <i>Principles and Practice</i> , Sixth Edition, William Stallings, Pearson
4.	Understanding Cryptography, Christof Paar, Jen Pelzl, Springer
5.	USENIX Security Symposium
6.	ACM Transactions on Information and system security
7.	IEEE Press Computer Security and Privacy
8.	Cryptography & Network Security, Forouzan, Tata McGraw Hill

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17M11CS121	<b>Semester ODD</b> (specify Odd/Even)	<b>Semester IInd DD VIII Session</b> 2018 - 2019 <b>Month from</b> January 2019 – June 2019
<b>Course Name</b>	Cloud and Web Services Software Engineering		
<b>Credits</b>	3-0-0	<b>Contact Hours</b>	...

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Sandeep Kumar Singh
	<b>Teacher(s)</b> (Alphabetically)	...

COURSE OUTCOMES		COGNITIVE LEVELS
<b>CO1</b>	Demonstrate role of Software engineering in combining cloud and web services computing paradigms for application development.	Understand Level (Level 2)
<b>CO2</b>	Analyze the requirements for developing web services and migrating applications to Cloud Services.	Analyzing Level (Level 4)
<b>CO3</b>	Categorize various cloud services into compute, storage, database, application, analytics, network, and deployment.	Analyzing Level (Level 4)
<b>CO4</b>	Make use of cloud and service engineering process to design, implement, and test, deploy and execute reusable restful and soap based web services.	Apply Level (Level 3)
<b>CO5</b>	Utilize some of the real world web services GOOGLE,AMAZON,EBAY,PAYPAL,FEDEX ETC.	Apply Level (Level 3)
<b>CO6</b>	Appraise different design patterns, Reference Architectures, performance metrics, testing tools and design patterns for Cloud.	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Distributed Software Engineering	Distributed Systems, Client and Server Computing, Architectural Patterns for distributed systems, Software as Service, Software Development Life Cycle for Cloud Platform, Software Design Strategies for Cloud Adoption	4
2.	Service-oriented software engineering	Service-Oriented Computing, Service-Oriented Architecture (SOA), Restful Services, Service Engineering and Service Composition.	6
3.	Introduction to XML and Wed Services	XML Technology Family, Structuring with XML- DTD, Schema, XML Processing, DOM,SAX, XML in Practice.	4
4.	Designing and Implementing Wed Services	Web Services and Web Service Technologies-SOAP, WSDL,	6
5.	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
6.	Requirements Engineering for Amazon Web service	Compute, Storage, Database, Application, Content Delivery, Analytics, Deployment and Management, Identity and Access Management, Salesforce.com, Microsoft Office 365, Box, Google Apps, Amazon Web Services, Concur, Zendesk, Dropbox, Slack etc	2

7.	Cloud Services from Amazon	IAM services-users, groups, policy and roles, Elastic Compute Cloud, Databases on Amazon, Storage on Amazon services,	6
8.	Address SE in Web services	Web Services Design Pattern, Metrics to Measure Web Service Performance.	3
9.	Address SE in Cloud services	Cloud Services Design Pattern, Metrics to Measure Cloud Service Availability, elasticity , Scalability, Load balancing, Auto scaling. Performance.	6
<b>Total number of Lectures</b>			<b>43</b>

### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (To be mapped from Assignment 1,2 and 3)
<b>Total</b>	<b>100</b>

**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.	Software Engineering Frameworks for the Cloud Computing Paradigm Zaigham Mahmood and Saqib Saeed
2.	Cloud Computing and Software Services Theory and Techniques <b>Syed A hson and</b> Dr. Mohammad Ilyas
3.	Engineering Long-Lasting Software: An Agile Approach Using SaaS and Cloud Computing Beta Edition 0.9.0 Armando Fox and David Patterson
4.	Cloud Computing: A Hands-On Approach Book by Arshdeep Bahga and Vijay K. Madiseti
5.	Cloud Computing Design Patterns Book by Amin Naserpour, Robert Cope, and Thomas Erl
6.	XML, Web Services, and the Data Revolution Book by Frank P. Coyle
7.	Software Engineering Book by Ian Sommerville
8.	Engineering Software As a Service: An Agile Approach Using Cloud Computing Textbook by Armando Fox and David Patterson
9.	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
10.	Cloud-Based Software Engineering PROCEEDINGS OF THE SEMINAR NO. 58312107

## Detailed Syllabus Lecture-wise Breakup

<b>Subject Code</b>	17M11CS122	<b>Semester:</b> Even (specify Odd/Even)	<b>Semester Even Session</b> 2018-2019 Month from Jan'19 to June'19
<b>Subject Name</b>	Performance Evaluation of Computing Systems		
<b>Credits</b>	3-0-0	<b>Contact Hours</b>	3
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Kavita Pandey	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Kavita Pandey	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Demonstrate the ability to describe the correct tools and techniques for computer system performance evaluation	Understand (level 2)
<b>CO2</b>	Identify the probability distribution in a given stream of data that corresponds to a source of randomness in a system.	Apply (level 3)
<b>CO3</b>	Design the appropriate model of a discrete, dynamic, stochastic system using the theory of random processes.	Apply (level 3)
<b>CO4</b>	Inspect the mathematical modeling techniques, Markov chains, queuing theory for analyzing the system.	Analyze (level 4)
<b>CO5</b>	Select the appropriate experiments and perform a simulation study of the given system.	Evaluate (level 5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
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	8

		with one server and multiple servers, Analysis of finite buffers queuing systems	
5.	Simulation modeling	Intoduction 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
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (...)	
<b>Total</b>		<b>100</b>	
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley, 1991.		
2.	K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2001.		
3.	Ross, Sheldon M. "A First Course in Probability". Upper Saddle River, N.J.: Pearson Prentice Hall, 2006		
4.	Obaidat, Boudriga, " <i>Fundamentals of Performance Evaluation of Computer and Telecommunication Systems</i> ", 2010, Wiley, ISBN 978-0-471-26983		
5.	Ross, Sheldon M. "Introduction to Probability Models". Amsterdam: Academic Press, 2010.		
6.	Fortier, Michel, "Computer Systems Performance Evaluation and Prediction", 2003, Elsevier, ISBN 1-55558-260-5		

**Detailed Syllabus**  
**Lab-wise Breakup**

<b>Course Code</b>	17M15CS121	<b>Semester ODD</b> (specify Odd/Even)	<b>Semester II Session</b> 2018 -2019 <b>Month from</b> January 2019- June 2019
<b>Course Name</b>	Cloud and Web Services Lab		
<b>Credits</b>	0-0-2	<b>Contact Hours</b>	2

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr.Sandeep Kumar Singh
	<b>Teacher(s)</b> (Alphabetically)	...

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Recall and show use of core JAVA concepts like classes, files, packages, modules, inheritance, exception handling and data structures.	Remembering Level (Level 1)
<b>CO2</b>	Demonstrate creation, validation and parsing of well-formed XML documents using DTD and XML Schema	Understanding Level (Level 2)
<b>CO3</b>	Experiment with Restful and Soap based web services.	Apply Level (Level 3)
<b>CO4</b>	Make use of Amazon Web Services (AWS) from free tier.	Apply Level (Level 3)
<b>CO5</b>	Utilize some of the real world web services GOOGLE,AMAZON,EBAY,PAYPAL,FEDEX ETC	Apply Level (Level 3)
<b>CO6</b>	Construct simple application using both cloud and web services.	Create Level (Level 6)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
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.	SOAP and Restful Web Services	Design and Create Web Services using SOAP and REST API	CO3
6.	Amazon Web Services-IAM	Create AMAZON Account and Work with IAM services through Console Interface	CO4,CO5
7.	Amazon Web Services- IAM	Using Command Line SDK Interface work with IAM services through Console Interface	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	Create and Configure Load balancers to manage high	CO4,CO5

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

### Evaluation Criteria

#### Components

#### Maximum Marks

LT1

20

LT2

20

ASSIGNMENTS & ATTENDANCE

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.	Software Engineering Frameworks for the Cloud Computing Paradigm Zaigham Mahmood and Saqib Saeed
2.	Cloud Computing and Software Services Theory and Techniques Syed A hson and Dr. Mohammad Ilyas
3.	Engineering Long-Lasting Software: An Agile Approach Using SaaS and Cloud Computing Beta Edition 0.9.0 Armando Fox and David Patterson
4.	Cloud Computing: A Hands-On Approach Book by Arshdeep Bahga and Vijay K. Madiseti
5.	Cloud Computing Design Patterns Book by Amin Naserpour, Robert Cope, and Thomas Erl
6.	XML, Web Services, and the Data Revolution Book by Frank P. Coyle
7.	Software Engineering Book by Ian Sommerville
8.	Engineering Software As a Service: An Agile Approach Using Cloud Computing Textbook by Armando Fox and David Patterson
9.	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
10.	Cloud-Based Software Engineering PROCEEDINGS OF THE SEMINAR NO. 58312107



**Detailed Syllabus**  
**Lab-wise Breakup**

<b>Course Code</b>	<b>17M15CS122</b>	<b>Semester Even...</b> (specify Odd/Even)	<b>Semester 2nd... Session 2018 -2019</b> <b>Month from Jan'19 to June'19</b>
<b>Course Name</b>	Performance Engineering Lab		
<b>Credits</b>	0-0-2	<b>Contact Hours</b>	2 hrs

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Kavita Pandey
	<b>Teacher(s)</b> (Alphabetically)	Dr. Kavita Pandey

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	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)
<b>CO2</b>	Compare the performance of different protocols by simulating various network scenarios in NS2 Simulator.	Analyze (level 4)
<b>CO3</b>	Design wired and wireless networks in NS2 and analyze the simulation results using AWK and Python programming.	Apply (level 3)
<b>CO4</b>	Examine the performance of M/M/1, M/D/1 and D/M/1 Queuing models in NS2.	Analyze (level 4)
<b>CO5</b>	Utilize the Weka Tool for analyzing data file.	Apply (level 3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
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	<ol style="list-style-type: none"> <li>1. Creation of Wired Network Scenarios</li> <li>2. Exploring the various Traffic Applications with the nodes and introduction of wired Trace file</li> <li>3. Wired Network Performance Analysis using AWK and Python</li> </ol>	3
4.	Queuing Analysis	<ol style="list-style-type: none"> <li>1. Simulation of various queues in NS2 and analyzing their performances on various performance metrics such as throughput, average delay and packet loss</li> <li>2. Simulation of various queue Scheduling Algorithms</li> </ol>	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
<b>Total</b>	<b>100</b>

**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.	<a href="https://www.cs.waikato.ac.nz/~ml/weka/">https://www.cs.waikato.ac.nz/~ml/weka/</a>
6.	<a href="http://nile.wpi.edu/NS/">nile.wpi.edu/NS/</a>
7.	The ns Manual, <a href="https://www.isi.edu/nsnam/ns/doc/ns_doc.pdf">https://www.isi.edu/nsnam/ns/doc/ns_doc.pdf</a>

**Detailed Syllabus**  
**Lab-wise Breakup**

<b>Course Code</b>	17M15CS123	<b>Semester</b> Even (Even)	<b>Semester ... Session</b> 2018 -2019 <b>Month</b> from Jan to June, 2019
<b>Course Name</b>	<b>IoT Systems Development Lab</b>		
<b>Credits</b>	1	<b>Contact Hours</b>	2 Hours

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Prakash Kumar
	<b>Teacher(s) (Alphabetically)</b>	Dr. Prakash Kumar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	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)
<b>CO2</b>	Develop user defined functional nodes and deploy it in Node-Red.	Apply (level 3)
<b>CO3</b>	Analyze various IoT Communication protocols using APIs with Arduino and Raspberry Pi along with sensors and actuators.	Analyze (level 4)
<b>CO4</b>	Apply and evaluate the characteristics of different IoT devices.	Evaluate (level 5)
<b>CO5</b>	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)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
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.	
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	Developing smart applications for various challenges and problems related to Sustainable Development, e.g., energy and waste management, water conservation, clean energy,	CO5

	Arduino and Raspberry Pi	improving public health, sustainable urbanization, smart agriculture etc.	
<i>n.</i>	...	...	...
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
Lab Test# 1		20	
Lab Test# 2		20	
D2D work		60	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Internet of Things: Architecture and Design Principles, Raj Kamal, McGrawHill.
<b>2</b>	"Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti
<b>3</b>	<a href="https://nodered.org/docs/getting-started">https://nodered.org/docs/getting-started</a>
<b>4.</b>	<a href="https://www.arduino.cc/en/Tutorial/HomePage">https://www.arduino.cc/en/Tutorial/HomePage</a>
<b>5.</b>	<a href="https://www.raspberrypi.org/documentation/">https://www.raspberrypi.org/documentation/</a>
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**Detailed Syllabus**  
**Lab-wise Breakup**

<b>Course Code</b>	17M17CS111	<b>Semester Odd</b> (specify Odd/Even)	<b>Semester II Session</b> 2018 -2019 <b>Month from Jan to June</b>
<b>Course Name</b>	Project Based Learning-I(Open Source Software Development)		
<b>Credits</b>	2	<b>Contact Hours</b>	4

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Tribhuwan Kumar Tewari
	<b>Teacher(s)</b> (Alphabetically)	Monali Mavani, Shilpa Bubhkar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
CO.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)
CO.2	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	Understanding Level (Level III)
CO.3	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	Analyzing Level (Level II)
CO.4	Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline	Applying Level (Level IV)
CO.5	Appraise by giving milestone presentations to their peers and faculty about their current progress.	Evaluating Level (Level V)
CO.6	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	Creating Level (Level VI)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
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	CO.1
2.	Divide role responsibilities to build a project on open data	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	CO.2
3.	Communicate effectively amongst team members, peers & evaluators	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	CO.3
4.	Plan & submit project development timeline	Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline	CO.4
5.	Presentations	Appraise by giving milestone presentations to their peers and faculty about their current progress.	CO.5

6	Prepare technical report	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	CO.6																
<p><b>Evaluation Criteria</b></p> <table border="0"> <thead> <tr> <th data-bbox="136 296 703 327"><b>Components</b></th> <th data-bbox="703 296 1479 327"><b>Maximum Marks</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="136 327 703 359">Fortnightly assessment</td> <td data-bbox="703 327 1479 359">48</td> </tr> <tr> <td data-bbox="136 359 703 390">Peer group evaluation</td> <td data-bbox="703 359 1479 390">8</td> </tr> <tr> <td data-bbox="136 390 703 422">Self assessment by the student</td> <td data-bbox="703 390 1479 422">8</td> </tr> <tr> <td data-bbox="136 422 703 453">Viva-voce at the end of the semester</td> <td data-bbox="703 422 1479 453">16</td> </tr> <tr> <td data-bbox="136 453 703 485">Semester end presentation by the students</td> <td data-bbox="703 453 1479 485">10</td> </tr> <tr> <td data-bbox="136 485 703 516">Report at the end of the semester</td> <td data-bbox="703 485 1479 516">10</td> </tr> <tr> <td data-bbox="136 516 703 548"><b>Total</b></td> <td data-bbox="703 516 1479 548"><b>100</b></td> </tr> </tbody> </table>				<b>Components</b>	<b>Maximum Marks</b>	Fortnightly assessment	48	Peer group evaluation	8	Self assessment by the student	8	Viva-voce at the end of the semester	16	Semester end presentation by the students	10	Report at the end of the semester	10	<b>Total</b>	<b>100</b>
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## Project Based Learning I (Open Data Centric Services Development)

### Detailed Syllabus Lab-wise Breakup

<b>Course Code</b>	17M27CS111	<b>Semester Even</b> (specify Odd/Even)	<b>Semester II Session</b> 2018 -2019 <b>Month from Jan to July</b>
<b>Course Name</b>	Project Based Learning I (Open Data Centric Services Development)		
<b>Credits</b>	2	<b>Contact Hours</b>	4

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Tribhuvan Kumar Tewari
	<b>Teacher(s)</b> (Alphabetically)	Monali Mavani, Shilpa Bubhkar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
CO.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)
CO.2	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	Understanding Level (Level III)
CO.3	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	Analyzing Level (Level II)
CO.4	Analyze and identify Open Source framework for writing data-centric applications over the latest technologies: .Net Core, C# 7.3, ASP.NET Web API, implementation; plan & submit project development timeline	Applying Level (Level IV)
CO.5	Appraise by giving milestone presentations to their peers and faculty about their current progress.	Evaluating Level (Level V)
CO.6	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	Creating Level (Level VI)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
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	CO.1
2.	Divide role responsibilities to build a project on open data	Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data	CO.2
3.	Communicate effectively amongst team members, peers &	Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers & evaluators	CO.3

	evaluators		
4.	Plan & submit project development timeline	Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline	CO.4
5.	Presentations	Appraise by giving milestone presentations to their peers and faculty about their current progress.	CO.5
6	Prepare technical report	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.	CO.6

### Evaluation Criteria

Components	Maximum Marks
Fortnightly assessment	48
Peer group evaluation	8
Self assessment by the student	8
Viva-voce at the end of the semester	16
Semester end presentation by the students	10
Report at the end of the semester	10
<b>Total</b>	<b>100</b>



## Internet of Things

### Detailed Syllabus Lecture-wise Breakup

<b>Course Code</b>	18M12CS115	<b>Semester (Even)</b>	<b>Semester II Session 2018 -2019</b> <b>Month from Jan to June, 2019</b>
<b>Course Name</b>	Internet of Things		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3 Lectures</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Prakash Kumar
	<b>Teacher(s) (Alphabetically)</b>	1. Dr. K. Rajalakshmi 2. Dr. Prakash Kumar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Identification of purpose, requirements and description of various components and specifications of IoT devices, applications and protocols.	Understand (level 2)
<b>CO2</b>	Develop the Process Model, Domain Model, Information Model and Service Model specifications using IoT communication protocols.	Apply (level 3)
<b>CO3</b>	Analyze the characteristics and functioning of various IoT specific communication protocols used in different layers of IoT devices.	Analyze (level 4)
<b>CO4</b>	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.	4
4.	ZigBee	ZigBee Architecture, Association, ZigBee Network Layer, APS Layer, ZDO, Security, ZCL etc.	4
5.	Design Principles for Web Connectivity	Web Communication Protocols for Connected Devices, Message communication Protocols, Web connectivity : SOAP, REST, HTTP RESTFUL, Web Sockets	7

6.	Internet Connecting Principles	Inter Connectivity, Internet Based Communication, IP addressing in IoT, Media Access Control, and Application Layer Protocols: HTTP, HTTPS, FTP, Telnet, etc.,	4
7.	Data Acquiring , Organizing, Processing and Analytics	Data Acquiring and Storage, Organizing the data, Transactions, Business Processes, Integration and Enterprises Systems, Analytics, Knowledge Acquiring, Managing and Storing process	4
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
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Presentations of assigned topics)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> 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, Arshadeep Bagha and Vijay Madiseti.
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
<i>m.</i>	...

## Nature Inspired Computation and Applications

### Detailed Syllabus

<b>Subject Code</b>	19M12CS211	<b>Semester Even</b>	<b>Semester Session 2018- 2019</b> <b>Month from Jan to June</b>
<b>Subject Name</b>	Nature Inspired Computation and Applications		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Anuja Arora
	<b>Teacher(s) (Alphabetically)</b>	Dr. Anuja Arora

SNO	Description	Cognitive Level (Bloom Taxonomy)
CS211.1	Identify the need of computational complexity, evolutionary, and approximate algorithms.	Apply Level (Level 3)
CS211.2	Understand nature inspired algorithms, its strength, weakness, and suitability	Understand Level (Level 2)
CS211.3	Make use of nature-inspired algorithms to design, learn and optimize problem	Apply Level (Level 3)
CS211.4	Evaluate performance of Nature inspired algorithm in context of problem solving in optimized manner	Evaluate Level (Level 5)
CS211.5	Create a real environment effective artificial system with the use of properties exhibited from nature.	Create Level (Level 6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Nature Inspired Computation Fundamental	Computational Complexity, NP-Hardness, Reductions, Approximation Algorithms vs. Heuristics, Newton Raphson Method, Characteristics of Natural Systems/Algorithms	5

2.	Empirical and Evolutionary Algorithms	Empirical Algorithms, Empirical hardness. Evolutionary Algorithms, optimization Fitness landscape Analysis, EA Theory	5
3	Evolutionary Algorithms	Genetic Algorithm, GA Encoding Techniques, Selection techniques, Variation(Crossover and Mutation) Techniques, Genetic Programming Differential Evolution Algorithm, sample problems, DE-Crossover and Mutation techniques	8
4	Swarm Intelligence	Particle Swarm Optimization, PSO Sample Problems, Ant Colony Optimization and real life case study solutions, Artificial Bee Colony Algorithm, Gravitational Search Algorithm, Diffusion Search	12
5	Modeling and problem solving	Artificial Neural network, , Artificial Immune System,Self-organizing Maps, Pattern Recognition and Binding, Forest's Algorithm, Harmony Search, Hebbian Learning, Boltzmann Machines	7
11	Case Studies and Applications	World Wide Web, Social Network, Image Processing, Earthquake, routing & scheduling	5
<b>Total number of Lectures</b>			<b>42</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
2.	Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, D.Floreano and C. Mattiussi (2008), MIT Press.
3.	Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.
4.	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
5.	Marco Dorriago, Thomas Stutzle," Ant Colony Optimization", PHI,2005
6.	Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006



**Detailed Syllabus**  
**Lecture-wise Breakup**

**Subject Code** 19M12CS214      **Semester Even**      **Semester – Eighth Session 2018 - 2019**  
**(specify Odd/Even)**      **Month from Jan to Jun 2019**

**Subject Name** Multimedia Design and Analysis

**Credits** 3      **Contact Hours** 3

<b>Faculty</b>	<b>Coordinator</b>	Dr. Suma Dawn
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<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Illustrate the basic concepts of Multimedia System.	Understanding Level (C2)
<b>CO2</b>	Make use of multimedia standards, tools and systems with a comprehensive understanding.	Apply Level (C3)
<b>CO3</b>	Identify relevant methods, parameters and visualization aspects of media applications.	Analyze Level (C4)
<b>CO4</b>	Examine the general issues in conventional and contemporary platforms for multimedia analysis.	Analyze Level (C4)
<b>CO5</b>	Perceive particular multimedia applications using computing resources based on best practices and design principles.	Evaluate Level(C5)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Sensory Perception, Technologies, Taxonomies, and Applications.	2
2.	Multimedia Types & Authoring Tools	MM Types - Text; Graphical – static, dynamic, medical, remote sensed imaging; Audio, Video, web pages, UI designs, Games including VR System, etc; MM Standards, datatypes and Compression; MM Authoring tools;	10
3.	Multimedia Design	Principles of multimedia design and production for creation, corrections, enhancement of new or existing content;	8
4.	Multimedia Analysis	Understanding and using multimedia features, video analysis and management, retrieval techniques, spatial indexing methods, long-term learning and Relevance Feedback, audio analysis and retrieval, semantic based retrieval techniques; MM databases and data mining – storage, searching, indexing, retrieval, etc; Visual Data Mapping;	12
5.	Case Studies	Large-scale image retrieval; Learning from 3D sensors; Learning Methods for Images and Audio data sets.	10

**Total number of Lectures**      **42**

<b>Evaluation Schème</b>	Test 1	<b>20</b>
	Test 2	<b>20</b>
	Test 3	<b>35</b>
	Project, Assignment and Class Assessment, Attendance	<b>25</b>
	Total	<b>100</b>

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

**JOURNALS & Conferences**

Elsevier  
 Computer Vision and Image Understanding  
 Digital Signal Processing: A Review Journal  
 Graphical Models and Image Processing  
 Journal of Visual Communication and Image Representation  
 Real-Time Imaging  
 Computers & Graphics  
 Data & Knowledge Engineering  
 Image and Vision Computing  
 Pattern Recognition  
 Pattern Recognition Letters  
 Signal Processing  
 Signal Processing: Image Communication

IEEE  
 IEEE Transactions on Circuits and Systems for Video Technology  
 IEEE Transactions on Multimedia  
 IEEE Transactions on Image Processing  
 IEEE Transactions on Medical Imaging  
 IEEE Transactions on PAMI

Kluwer  
 International Journal of Computer Vision  
 Journal of Intelligent Information System  
 Multidimensional Systems and Signal Processing

SPIE  
 Journal of Electronic Imaging