

# **SEMESTER 8**

**PERIOD: March 2022 – June 2022**

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### ASSIGNMENT SCHEDULE FOR S8 IT

<b>Week</b>	<b>Subject</b>	<b>Subject Teacher</b>
Week 1	Data Analytics	Ms. Sreeja M.U
Week 2	Cryptography & cyber security	Ms. Bency Wilson
Week 3	Internet of things	Ms. Jean P Johny
Week 4	Cloud computing	Mr. Mathews Abraham
Week 5	Data Analytics	Ms. Sreeja M.U
Week 6	Cryptography & cyber security	Ms. Bency Wilson
Week 7	Internet of things	Ms. Jean P Johny
Week 8	Cloud computing	Mr. Mathews Abraham

Prepared By

**Dr. Lakshmi K.S**

Approved By

**Dr. Neeba E.A, HOD**

## Program Outcomes (PO)

### Information Technology Program Students will be able to:

**PO 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO 12. Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSO)**

#### **Information Technology Program Students will be able to:**

**PSO1:** Acquire skills to design, analyse and develop algorithms and implement those using high-level programming languages.

**PSO2:** Contribute their engineering skills in computing and information engineering domains like network design and administration, database design and knowledge engineering.

**PSO3:** Develop strong skills in systematic planning, developing, testing, implementing and providing IT solutions for different domains which helps in the betterment of life.

### **Program Educational Objectives (PEO)**

Graduates of Information Technology program shall

**PEO 1:** Have strong technical foundation for successful professional careers and to evolve as key-players/ entrepreneurs in the field of information technology.

**PEO 2:** Excel in analyzing, formulating and solving engineering problems to promote life-long learning, to develop applications, resulting in the betterment of the society.

**PEO 3:** Have leadership skills and awareness on professional ethics and codes.

**IT404**

**DATA ANALYTICS**

## COURSE INFORMATION SHEET

PROGRAMME: Information Technology	DEGREE: BTECH
COURSE: Data Analytics	SEMESTER: S8 CREDITS: 3
COURSE CODE: IT404 REGULATION: 2016	COURSE TYPE: CORE
COURSE AREA/DOMAIN: Artificial Intelligence	CONTACT HOURS: 4hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY):NA	LAB COURSE NAME: NA

### SYLLABUS:

UNIT	DETAILS	HOURS
	Data Analysis, Analysis Vs Reporting, Different Statistical Techniques of Data Analysis, Descriptive Analytics, Regressive Models, Neural Networks. Descriptive Analytics- Association and Sequential Rules, Big Data and its characteristics, Data Analysis using R language, Data visualization techniques.	
1	Introduction to Data Analysis - Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools. Statistical concepts: Sampling distributions, re-sampling, statistical inference, prediction error.	8
2	Predictive Analytics – Regression, Decision Tree, Neural Networks. Dimensionality Reduction - Principal component analysis	6
3	Descriptive Analytics - Mining Frequent itemsets - Market based model – Association and Sequential Rule Mining - Clustering Techniques – Hierarchical – K- Means	6
4	Introduction to Big data framework - Fundamental concepts of Big Data management and analytics - Current challenges and trends in Big Data Acquisition.	7
5	Data Analysis Using R - Introduction to R, R Graphical User Interfaces, Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, Visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation, Statistical Methods for Evaluation	8
6	Popular Big Data Techniques and tools- Map Reduce paradigm and the Hadoop system- Applications Social Media Analytics- Recommender Systems- Fraud Detection.	7
TOTAL HOURS		42

**TEXT/REFERENCE BOOKS:**

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data. John Wiley & Sons, 2015.
T	Jaiwei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier, 2006.
T	Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007
R	Michael Minelli, Michele Chambers, AmbigaDhiraj , "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends", John Wiley & Sons, 2013.
R	Bart Baesens," Analytics in a Big Data World: The Essential Guide to Data Science and itsApplications", John Wiley & Sons, 2014.
R	Min Chen, Shiwen Mao, Yin Zhang, Victor CM Leung ,Big Data: Related Technologies,Challenges and Future Prospects, Springer, 2014

**COURSE PRE-REQUISITES:CS208 Principles of database design****COURSE OBJECTIVES:**

1	To understand the data analysis techniques
2	To understand the concepts behind the descriptive analytics and predictive analytics of data.
3	To familiarize with Big Data and its sources
4	To familiarize data analysis using R programming
5	To understand the different visualization techniques in data analysis

**COURSE OUTCOMES:****Students will be able to:**

SINo.	DESCRIPTION
1	Understand the statistical concepts and inferences to analyse different types of data, and characterize it to make more intelligent predictions (L2)
2	Apply theoretical foundations of decision trees and neural networks classifier to make decision modelling process more intelligent. (L3)
3	To understand the concepts behind the association rule mining and clustering techniques (L2)
4	Understand the fundamental concepts of Big Data management and analytics (L2)
5	Learn data analysis using R programming. (L2)
6	Understand Map Reduce paradigm and the Hadoop system and identify its applicability in real life problems. (L3)



## CO MAPPING WITH PO, PSO

CO No.	Programme Outcomes (POs)												Programme-Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	1					1			2	1	2	
2	3	3	3	1					1			1	1	2	1
3	3	3	3	1		1			1			1	2	1	1
4	3	3	3	1					1			2	1	1	1
5	3		3	2									1	1	1
6	3		3	3									1	1	1
IT404															

## JUSTIFICATION FOR CO-PO-PSO CORRELATION:

MAPPING	LEVEL	JUSTIFICATION
IT404.1-PO1	3	Knowledge of various data analytic approaches involves solving complex engineering problems
IT404.1-PO2	3	Principles of mathematics and engineering sciences are used in various aspects of data analytic approaches
IT404.1-PO3	3	Using the knowledge of statistical concepts, we can design and develop solutions for complex engineering problems
IT404.1-PO4	1	Statistical concepts and inferences can be used to design and conduct experiments to provide valid conclusions
IT404.1-PO9	1	Expertise developed, which will enable the student to become a productive member of a design team
IT404.1-PO12	2	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge
IT404.2-PO1	3	Comparative study of different dimensionality reduction techniques involves solving complex engineering problems

IT404.2-PO2	3	Principles of mathematics and engineering sciences are used in various aspects of dimensionality reduction techniques.
IT404.2-PO3	3	Knowledge of neural network techniques can be used to design and develop solutions for complex engineering problems
IT404.2-PO4	3	Decision tree techniques knowledge can be used to design and conduct experiments to provide valid conclusions
IT404.2-PO9	1	Expertise developed, which will enable the student to become a productive member of a design team
IT404.2-PO12	1	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge
IT404.3-PO1	3	Knowledge of theoretical foundations of association rule mining involves solving complex engineering problems
IT404.3-PO2	3	Principles of mathematics and engineering sciences are used in theoretical foundations of clustering techniques to label data points.
IT404.3-PO3	3	Knowledge of theoretical foundations of clustering techniques can be used to design and develop solutions for complex engineering problems
IT404.3-PO4	1	Theoretical foundations of frequent pattern mining knowledge can be used to design and conduct experiments to provide valid conclusions
IT404.3-PO6	1	Knowledge of theoretical foundations of association rule mining and clustering techniques will help understand issues and societal problems related to cybercrimes and computer hacking
IT404.3-PO9	1	Expertise developed, which will enable the student to become a productive member of a design team

IT404.3- PO12	1	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge
IT404.4-PO1	3	Knowledge of the fundamental concepts of Big Data management and analytics helps in solving complex engineering problems
IT404.4-PO2	3	Principles of mathematics and engineering sciences are used in various aspects of Big Data management and analytics
IT404.4-PO3	3	Knowledge of the fundamental concepts of Big Data management and analytics can be used to design and develop solutions for complex engineering problems
IT404.4-PO4	1	Various Big Data management and analytics concepts knowledge can be used to design and conduct experiments to provide valid conclusions
IT404.4-PO9	1	Expertise developed, which will enable the student to become a productive member of a design team
IT404.4- PO12	2	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge
IT404.5-PO1	3	Study of data analysis using R programming involves solving complex engineering problems
IT404.5-PO3	3	data analysis using R programming knowledge can be used to design and develop solutions for complex engineering problems
IT404.5-PO4	2	Exploratory data analysis can be used to design and conduct experiments to provide valid conclusions
IT404.6-PO1	3	Knowledge of Map Reduce paradigm and the Hadoop system involves solving complex engineering problems

IT404.6-PO3	3	Knowledge of Map Reduce paradigm and the Hadoop system can be used to design and develop solutions for complex engineering problems
IT404.6-PO4	3	Map Reduce paradigm and the Hadoop system knowledge can be used to conduct experiments in real life problems to provide valid conclusions

### JUSTIFICATION FOR CO-PSO MAPPING

MAPPING	LEVEL	JUSTIFICATION
IT404.1-PSO1	1	Various data analytic approaches Acquire skills to design, analyse and develop algorithms and implement them using high-level programming languages.
IT404.1-PSO2	2	Knowledge of data analytics concepts contribute skills in computing and knowledge engineering domain.
IT404.2-PSO1	1	Knowledge of different dimensionality reduction techniques Acquire skills to design, analyse and develop algorithms and implement them using high-level programming languages.
IT404.2-PSO2	2	Different decision trees techniques concepts contribute skills in computing and knowledge engineering domain.
IT404.2-PSO3	1	Knowledge of different decision trees and neural networks classifier techniques contribute to develop strong skills in developing IT solutions for different domains which helps in the betterment of life.
IT404.3-PSO1	2	Theoretical foundations of the association rule mining and clustering techniques acquire skills to design, analyse and develop algorithms and implement them using high-level programming languages
IT404.3-PSO2	1	Theoretical foundations of the association rule mining and clustering techniques contribute skills in computing and knowledge engineering domain

IT404.3- PSO3	1	Theoretical foundations of the association rule mining and clustering techniques contribute to develop strong skills in developing IT solutions for different domains which helps in the betterment of life.
IT404.4- PSO1	1	Study of fundamental concepts of Big Data management and analytics acquire skills to design, analyse and develop algorithms and implement them using high-level programming languages
IT404.4- PSO2	1	Knowledge of fundamental concepts of Big Data management and analytics contribute skills in computing and knowledge engineering domain.
IT404.4- PSO3	1	Fundamental concepts of Big Data management and analytics knowledge contribute to develop strong skills in developing IT solutions for different domains which helps in the betterment of life.

**GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:**

SNO	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Hands on sessions on Hadoop MapReduce	Conduct workshops on Hadoop and MapReduce programming	1, 2, 3, 4, 5, 6
2	Hands on session on R-programming	Conduct workshops on R-programming	1, 2, 3, 4, 5, 6

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURE/NPTEL ETC

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

S No:	DESCRIPTION	PO MAPPING
1	.SPARK Framework	1, 2, 3, 4, 5, 6
2	Deep learning	1, 2, 3, 4, 5, 6

**DESIGN AND ANALYSIS TOPICS:**

Sl. No.	DESCRIPTION	PO MAPPING
1	Dimensionality Reduction techniques	1, 2, 3, 4, 5, 9, 10
2	Classification algorithms	1, 2, 3, 4, 5, 9, 10
3	Clustering algorithms	1, 2, 3, 4, 5, 9, 10

**WEB SOURCE REFERENCES:**

1.	<a href="https://onlinecourses.nptel.ac.in/noc18_cs26/">https://onlinecourses.nptel.ac.in/noc18_cs26/</a>
2.	<a href="https://www.upgrad.com/machine-learning-and-artificial-intelligence">https://www.upgrad.com/machine-learning-and-artificial-intelligence</a>

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

<input checked="" type="checkbox"/> CHALK & TALK	<input checked="" type="checkbox"/> STUD. ASSIGNMENT	<input type="checkbox"/> WEB RESOURCES	<input type="checkbox"/> STUD. LAB PRACTICES
<input checked="" type="checkbox"/> LCD/SMART BOARDS	<input type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> ADD-ON COURSES	

**ASSESSMENT METHODOLOGIES-DIRECT**

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

**ASSESSMENT METHODOLOGIES-INDIRECT**

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS

**Prepared by****Ms. Sreeja M. U.  
(Faculty in Charge)****Approved by****Dr. Neeba E.A  
(HoD)**

## Course Plan

Year:	2022	Class: S8 IT	
Subject:	IT 404 Data Analytics		
Sl.No	Module	Day	Planned
1	I	Day 1	Introduction to Data Analytics
2	I	Day 2	Evolution of Analytic scalability, analytic processes and tools
3	I	Day 3	Analysis vs reporting - Modern data analytic tools.
4	I	Day 4	Statistical concepts
5	I	Day 5	Sampling distributions, re-sampling
6	I	Day 6	Statistical inference
7	I	Day 7	Prediction error
8	I	Day 8	Revision Module-I
9	II	Day 9	Predictive Analytics – Regression
10	II	Day 10	Decision Tree
11	II	Day 11	Neural Networks.
12	II	Day 12	Dimensionality reduction
13	II	Day 13	Principle Component Analysis
14	II	Day 14	Revision Module-II
15		Day 15	Test-1
16	III	Day 16	Descriptive Analytics - Mining Frequent itemsets
17	III	Day 17	Market based model
18	III	Day 18	Association and Sequential Rule Mining
19	III	Day 19	Clustering Techniques
20	III	Day 20	Hierarchical Clustering
21	III	Day 21	K- Means clustering
22	IV	Day 22	Introduction to Big data framework
23	IV	Day 23	Fundamental concepts of Big Data management and analytics
24	IV	Day 24	Current challenges and trends in Big Data Acquisition
25	IV	Day 25	Revision Module-IV

26	V	Day 26	Data Analysis Using R - Introduction to R,
27	V	Day 27	R Graphical User Interfaces, Data Import and Export
28	V	Day 28	Attribute and Data Types
29	V	Day 29	Descriptive Statistics
30	V	Day 30	Exploratory Data Analysis,
31	V	Day 31	Visualization Before Analysis, Dirty data
32	V	Day 32	Visualizing a Single Variable, Examining Multiple Variables,
33	V	Day 33	Data Exploration Versus Presentation,
34	V	Day 34	Statistical Methods for Evaluation
35	V	Day 35	Revision Module-V
36	VI	Day 36	Popular Big Data Techniques and tools
37	VI	Day 37	Map Reduce paradigm
38	VI	Day 38	the Hadoop system
39	VI	Day 39	Applications Social Media Analytics- .
40	VI	Day 40	Recommender Systems-
41	VI	Day 41	Fraud Detection
42	VI	Day 42	Revision Module VI

## **Assignment Questions**

### **Assignment 1**

1. Differentiate Analytics and reporting with a detailed example.
2. Give a short description on the most frequently used data analytic tools.
3. Draw multilayer perceptron network and explain functionalities of each unit. Justify how can it be used in analytics?

### **Assignment 2**

1. Write a short note on the emerging challenges of big data acquisition.
2. Explain in detail any one application of social media analytics.



**IT402**

**Cryptography and Cyber security**

## COURSE INFORMATION SHEET

PROGRAMME: INFORMATION TECHNOLOGY	DEGREE: BTECH
COURSE: <b>CRYPTOGRAPHY AND CYBER SECURITY</b>	SEMESTER: Eighth CREDITS: 3
COURSE CODE: IT402 REGULATION:2010	COURSE TYPE: CORE
COURSE AREA/DOMAIN: Security	CONTACT HOURS:3 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY):No	LAB COURSE NAME:NA

### SYLLABUS:

UNIT	DETAILS	HOURS
I	Basics of Algebra and Number Theory: Integer Arithmetic, Modular Arithmetic, Algebraic structures, $GF(2^n)$ Fields, Matrices, Prime Numbers, Fermat's and Euler's Theorem, Primality Testing, Factorization, Chinese Remainder Theorem, Linear and Quadratic Congruence, Discrete Logarithms.	7
II	Introduction to Security:-Security Goals – Security services (Confidentiality, Integrity, Authentication, Non-repudiation, Access control) – Security Mechanisms (Encipherment, Data Integrity, Digital Signature, Authentication Exchange, Traffic Padding, Routing Control, Notarization, Access control)- Security Principles. Introduction to Cryptography:- Kerckhoff's Principle -Classification of Cryptosystems- Cryptanalytic attacks- Cipher Properties (Confusion, Diffusion).	7
III	Traditional Secret Key Ciphers:- Substitution Ciphers (mono alphabetic ciphers, poly alphabetic ciphers)-Transposition Ciphers-Stream and Block Ciphers. Modern Secret Key Ciphers:- Substitution Box-Permutation Box-Product Ciphers	7
IV	Data Encryption Standard (DES) (Fiestel and Non-Fiestel Ciphers, Structure of DES, DES Attacks, 2-DES, 3-DES) - Advanced Encryption Standard (AES) (Structure, Analysis)-Cryptographic Hash Functions– Properties - Secure Hash Algorithm-Message Authentication Code (MAC).	7
V	Public Key Cryptosystems (PKC): - Types of PKC –Trapdoor - one way functions -RSA Cryptosystem (Integer Factorisation Trapdoor, Key Generation, Encryption, Decryption) - El Gamal Cryptosystem (Discrete Logarithm Trapdoor, Key Generation, Encryption, Decryption) - Diffie-	7

	Hellman Key Exchange Protocol, Man in the Middle attack on Diffie-Hellman Protocol.	
VI	Digital Signature:-Signing – Verification - Digital signature forgery (Existential forgery, Selective forgery, Universal forgery) - RSA Digital Signature Scheme - ElGamal Signature Scheme - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload- Intruders, Intrusion Detection, Distributed Denial of Service attacks	7
TOTAL HOURS		42

**TEXT/REFERENCE BOOKS:**

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	Behrouz A. Forouzan, Dedeep Mukhopadhyay “Cryptography & Network Security”, Second Edition, Tata McGraw Hill, New Delhi, 2010
T	Douglas R. Stinson, “Cryptography: Theory and Practice”, Third Edition, CRC Press.
T	William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Fourth Edition, 2006.
T	Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGraw Hill, 2003.
R	Bernard Menezes, Network Security and Cryptography-Cengage Learning India, 2011
R	Bruce Schneier, “Applied Cryptography: Protocols, Algorithms, and Source Code in C”, Second Edition, John Wiley and Sons Inc, 2001.
R	Thomas Mowbray, “Cybersecurity : Managing Systems Conducting Testing, and Investigating Intrusions”, John Wiley, 2013
R	Wenbo Mao, “ Modern Cryptography- Theory & Practice”, Pearson Education, 2006.

**COURSE PRE-REQUISITES:**

C.CODE	COURSE NAME	DESCRIPTION	SEM
CS201	Discrete computational structures	To know the importance of learning theories and strategies in Mathematics	Third

**COURSE OBJECTIVES:**

1	To understand the mathematics behind Cryptography
2	To understand the security concerns and vulnerabilities

3	To familiarize with different types of cryptosystems
4	To create an awareness for the design of various cryptographic primitives
5	To analyze different types of attacks on various cryptosystems.

**COURSE OUTCOMES:**

SINO	DESCRIPTION	Blooms' Taxonomy Level
C402.1	Students will be able to <b>solve and relate</b> mathematic concepts behind the cryptographic algorithms.	Understand and Apply (level2 and 3)
C402.2	Students will be able to <b>explain</b> basic concepts and algorithms of cryptography, including encryption/decryption and hash functions.	Understand (level 2)
C402.3	Students will be able to <b>describe</b> various network security practice applications	Knowledge (level 1)
C402.4	Students will be able <b>analyze</b> protocols for various security objectives with cryptographic tools	Apply (level 3 )
C402.5	Students will be able to <b>evaluate</b> the role played by various security mechanisms like passwords, access control mechanisms, firewalls etc.	Evaluate (level 5)

**CO-PO AND CO-PSO MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P 0	P 1	P 2	PSO 1	PSO 2	PSO 3
C402.1	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
C402.2	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-
C402.3	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-
C402.4	-	2	2	1	3	-	-	-	-	-	-	-	-	-	-
C402.5	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-
C402	3	2	2	1	3	-	-	-	-	-	-	-	2	1	-

## JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/MEDIUM/HIGH	JUSTIFICATION
C402.1-PO1	H	Students will get to know about the maths behind the cryptographic algorithm which can contribute to the basic engineering knowledge
C402.1-PO2	M	Using the knowledge in basic maths students can analyze and formulate solutions for some problems
C402.1-PO4	L	The knowledge in the mathematics behind the subject helps students to do research on developing new overcoming the demerits of the existing one
C402.1-PSO1	M	The knowledge in maths will help in formulating new algorithms.
C402.2-PO2	L	Only if students know the existing cryptographic algorithms they can formulate new one doing problem analysis
C402.2.PO4	L	Only if students know the existing cryptographic algorithms they can conduct investigations of complex problems and provide valid conclusions
C402.2-PSO2	L	knowing the existing cryptographic algorithm will help them while they contribute to the network design
C402.3-PO3	L	Only if students know the existing network security applications they can develop new one understanding the problems of the existing ones
C402.3-PSO2	L	knowing the existing network security applications will help them while they contribute to the network design
C402.4-PO2	M	Students will be able to analyze various security requirements and come up with the security protocol for each requirement
C402.4-PO3	M	Students will be able to understand various security issues and design protocol to specified requirement
C402.4-PO4	L	Having knowledge on the existing protocols will help them in conducting further investigations on the security requirement

C402.4- PO5	H	Having knowledge on the existing protocols will help them to choose the appropriate one meeting the specific security requirement
C402.5- PO4	M	Having knowledge on the existing security mechanisms like access control, passwords etc will help them in conducting further investigations on the security requirement
C402.5- PO4	H	Having knowledge on the existing security mechanisms like access control, passwords etc will help them in choosing the appropriate technique in meeting the specific security requirement

#### **GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:**

<b>SNO</b>	<b>DESCRIPTION</b>	<b>PROPOSED ACTIONS</b>	<b>RELEVANCE WITH POs</b>	<b>RELEVANCE WITH PSOs</b>
1	Topics on Web Security – SSL, TLS, SET	Assignment/NPTEL	3,4,5	

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

#### **TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

<b>SNO</b>	<b>DESCRIPTION</b>	<b>RELEVANCE WITH POs</b>	<b>RELEVANCE WITH PSOs</b>
1	To familiarize students on the topic called steganography which plays an important role in information security	3,4,5	
2	Familiarizing students on quantum cryptography	3,4,5	

#### **WEB SOURCE REFERENCES:**

1	<a href="http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.html">http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.html</a>
2	<a href="http://www.math.utk.edu/~finotti/papers/grad.pdf">http://www.math.utk.edu/~finotti/papers/grad.pdf</a>
3	<a href="http://www.nptel.iitm.ac.in/courses/106103015/3">http://www.nptel.iitm.ac.in/courses/106103015/3</a>
4	<a href="https://engineering.purdue.edu/kak/compsec/">https://engineering.purdue.edu/kak/compsec/</a>

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

<input type="checkbox"/> CHALK & TALK	<input type="checkbox"/> STUD. ASSIGNMENT	<input type="checkbox"/> WEB RESOURCES	
<input type="checkbox"/> LCD/SMART BOARDS	<input type="checkbox"/> STUD. SEMINARS	<input type="checkbox"/> ADD-ON COURSES	

**ASSESSMENT METHODOLOGIES-DIRECT**

<input type="checkbox"/> ASSIGNMENTS	<input type="checkbox"/> STUD. SEMINARS	<input type="checkbox"/> TESTS/MODEL EXAMS	<input type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

**ASSESSMENT METHODOLOGIES-INDIRECT**

<input type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS

**Prepared by**  
**BENCY WILSON**

**Approved by**  
**(HOD)**

## Course Plan

Si.No	Day	Topic
1	1	Basics of Algebra and Number Theory: Integer Arithmetic
2	1	Basics of Algebra and Number Theory: Integer Arithmetic
3	1	Basics of Algebra and Number Theory: Integer Arithmetic
4	1	Modular Arithmetic
5	1	Modular Arithmetic
6	1	Algebraic structures
7	1	Algebraic structures
8	1	Algebraic structures
9	1	Prime Numbers
10	1	Fermat's and Euler's Theorem
11	1	Fermat's and Euler's Theorem
12	1	Primality Testing, Factorization
13	1	Primality Testing, Factorization
14	1	Chinese Remainder Theorem
15	1	Chinese Remainder Theorem
16	1	Linear and Quadratic Congruence, Discrete Logarithms
17	2	Introduction to Security:-Security Goals – Security services (Confidentiality, I
18	2	Integrity, Authentication, Non-repudiation, Access control)
19	2	Security Mechanisms (Encipherment, Data Integrity,
20	2	Digital Signature, Authentication Exchange, Traffic Padding,
21	2	Routing Control, Notarization, Access control)
22	2	Security Principles. Introduction to Cryptography:- Kerckhoff's Principle -Classification of Cryptosystems
23	2	Cryptanalytic attacks- Cipher Properties (Confusion, Diffusion).
24	3	Traditional Secret Key Ciphers:- Substitution Ciphers (mono alphabetic ciphers)
25	3	poly alphabetic ciphers)-Transposition Ciphers-Stream and Block Ciphers.
26	3	Modern Secret Key Ciphers:- Substitution Box-
27	3	Permutation Box-Product Ciphers
28	4	Data Encryption Standard (DES) (Fiestel and Non-Fiestel Ciphers,
29	4	Structure of DES, DES Attacks



30	4	2-DES, 3-DES) - Advanced Encryption Standard (AES) (Structure, Analysis)-
31	4	Cryptographic Hash Functions
32	4	Properties - Secure Hash Algorithm-Message Authentication Code (MAC).
33	5	Public Key Cryptosystems (PKC): - Types of PKC
34	5	Trapdoor - one way functions -RSA Cryptosystem
35	5	(Integer Factorisation Trapdoor, Key Generation, Encryption, Decryption)
36	5	- El Gamal Cryptosystem (Discrete Logarithm Trapdoor
37	5	Diffie-Hellman Key Exchange Protocol, Man in the Middle attack on Diffie-Hellman Protocol
38	6	Digital Signature:-Signing – Verification - Digital signature forgery
39	6	(Existential forgery, Selective forgery, Universal forgery)
40	6	RSA Digital Signature Scheme - ElGamal Signature Scheme
41	6	IP Security Overview, IP Security Architecture,
42	6	Authentication Header, Encapsulating Security Payload-
43	6	Intruders, Intrusion Detection
44	6	Distributed Denial of Service attacks

## **Assignment Questions**

### **Assignment I**

1. What are the common primality test available.
2. Prove that the remainder of a number when divided by 3 is the same as the remainder of the sum of its digits
3. What is a permutation generator. Check if it is a field or not.

### **ASSIGNMENT II**

1. Intruders, Intrusion Detection.
2. Distributed Denial of Service attacks

## Tutorial Questions

### TUTORIAL 1:

1. With an example explain Hill Cipher.
2. Using play fair cipher algorithm encrypt the message using the key "MONARCHY" and explain

Secret Key =

L	G	D	B	A
Q	M	H	E	C
U	R	N	I/J	F
X	V	S	O	K
Z	Y	W	T	P

Hint:

For Example :Let us encrypt the plaintext "hello" using the key in Figure 3.13.

he → EC	lx → QZ	lo → BX
Plaintext: hello	Ciphertext: ECQZBX	

3. Find the solutions to the simultaneous equations, use Chinese remainder theorem

$$x \equiv 2 \pmod{3}$$

$$x \equiv 3 \pmod{5}$$

$$x \equiv 2 \pmod{7}$$

4. Compare DES and AES algorithm.

# **IT462 Internet of Things**

## COURSE INFORMATION SHEET

PROGRAMME: <b>INFORMATION TECHNOLOGY</b>	DEGREE: <b>BTECH (March 2022– June 2022)</b>
COURSE: <b>INTERNET OF THINGS</b>	SEMESTER: <b>VIII</b>
COURSE CODE: IT 462	COURSE TYPE: <b>CORE</b>
COURSE AREA/DOMAIN: <b>IoT,Cloud and Bigdata</b>	CONTACT HOURS: <b>4 hours/Week.</b>
CORRESPONDING LAB COURSE CODE (IF ANY):	LAB COURSE NAME: <b>NIL</b>

### SYLLABUS:

UNIT	DETAILS	HOURS
I	Internet: An Overview: Introduction, History of Internet, Internet Technology, Basics of Internet, Classification of Internet, Topologies, Applications, Internet of Things and Related Future Internet Technologies, Internet of Things Vision, Towards the IoT Universe(s), The Internet of Things Today	5
II	Internet Communication Technologies, Networks and Communication , Processes , Data Management , IoT Related Standardization , Protocol, Communication protocols, Types of communication protocols, Addressing Schemes, M2M Service Layer Standardisation, OGC Sensor Web for IoT, IEEE and IETF, ITU-T, Current trends in Internet: Internet of everything, Internet of everything, Internet of things, Storage, Databases	8
III	Cloud Technology: Introduction, Overview, Why cloud ? , How to implement cloud ?, Usage of cloud, Scalable Computing, Cloud computing, Characteristics of cloud computing, Classifications, Virtual machines, Virtualization technology, Models of distributed and cloud computing, Distributed computing, Clustering, Grid computing, Service oriented Architecture. Performance and Security, Performance analysis, Security, Implementations of Cloud computing.	8
IV	Internet of Things: IoT : An overview, Introduction, Characteristics, IoT technology, IoT as a Network of Networks, IoT architecture, IoT developments, Smart Technology, Brief introduction of smart technology, Smart devices, Smart environment. IoT Components, Basic Principles, Embedded technology Vs IoT, Sensors, Wireless sensor networks, Aurdino, Rasberry Pi	7
V	Prototyping in IoT, Basics of prototypes, Prototyping in IoT, Communication in IoT, Prototyping model, Data handling in IoT, fabryq, Bluetooth Low	

	Energy, µfabryq, Operating Systems for Low-End IoT Devices, Open Source Oss, Contiki, RIOT, FreeRTOS, TinyOS, OpenWSN, nuttX, eCos, mbedOS, L4 microkernel family, uClinux, Android and Brillo, Other open source OS, Closed Source Oss, ThreadX, QNX, VxWorks, Wind River Rocket, PikeOS, emboss, Nucleus RTOS, Sciopta, µC/OS-II and µC/OS-III.	7
VI	Big Data, BigData versus IoT, BigData influcement in IoT, A cyclic model of BigData, Cloud and Internet of Things, Data Storage, Analysis and Communication, Classifications, Characteristics of BigData, Types of BigData, Analysing of Data, Applications, Real time situations, BigData tools, A combined application of IoT, Cloud and BigData in IoT	7
<b>TOTAL HOURS</b>		<b>42</b>

#### TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1	Anthony Townsend., Smart cities: big data, civic hackers, and the quest for a new utopia, WW Norton & Company, 2013
2	Arshdeep Bahga, Vijay Madisetti, , Internet of things: a hands-on approach, CreateSpace Independent Publishing Platform, 2013
3	Dieter Uckelmann, Mark Harrison, Michahelles Florian (Ed.), Architecting the internet of things, Springer, 2011
4	Dr. Ovidiu Vermesan, Dr Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013
5	Olivier Hersent, David Boswarthick, Omar Elloumi The internet of things: key applications and protocols, Wiley, 2012.
6	Adrian McEwen, Hakim Cassimally, Designing internet of things, John Wiley & Sons, 2013 .

#### COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
<b>IT 307</b>	<b>COMPUTER NETWORKS</b>	<b>Basic awareness of network communication</b>	<b>V</b>
<b>IT 401</b>	<b>EMBEDDED SYSTEMS</b>	<b>Basic awareness of embedded systems,AurdinoRasberry pi</b>	<b>VII</b>

**COURSE OBJECTIVES:**

1	To explore the world of current technologies.
2	To understand with the concepts of internet of things
3	To get a knowledge basics in the history and developments of internet.
4	To be familiar with the big data and cloud in the IoT basis

**COURSE OUTCOMES:**

SI No	DESCRIPTION	Blooms' Taxonomy Level
C01	Graduate will be able to <b>discuss</b> the world of current technologies.	Understand (Level 2)
C02	Graduate will be able to <b>describe</b> the fundamentals of IoT	Understand (Level 2)
C03	Graduates will be able to <b>interpret</b> models of distributed and cloud computing	Apply (Level 3)
C04	Graduates will be able to <b>examine</b> protoypes for Internet of Things	Analyze (Level 4)
C05	Graduates will be able to <b>judge</b> the applications of IoT, BigData and cloud	Evaluate (Level 5)

**CO-PO AND CO-PSO MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C0 1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
C0 2	-	2	3	2	-	-	-	-	-	-	-	-	-	-	3
C0 3	-	2	2	-	-	-	-	-	-	-	-	-	1	-	2
C0 4	1	2	3	-	-	-	-	-	-	-	-	-	2	2	-
C0 5	-	-	3	-	-	-	-	-	-	-	-	-	3	-	-

## JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/MEDIUM/HIGH	JUSTIFICATION
C01-P01	L	Graduate attains a basic knowledge about current technologies.
C01-PS01	M	Graduate is made able to identify the core principles of basic technologies in IoT
C02-P02	M	Graduate is made capable of identifying the basic suitable technologies to design IoT based applications
C02-P03	H	Graduate is able to design simple and creative IoT projects.
C02-P04	M	Graduate is able to apply the concept of cloud and bigdata in developing IoT based applications.
C02-PS03	M	Graduate is able to use the basic prototypes of IoT for developing innovative applications
C03-P02	M	Graduate will be able to use cloud models to store and maintain data.
C03-P03	M	Graduates are able to design and develop solutions based on IoT based distributed models.
C03-PS01	L	Graduate attains a basic knowledge on prototypes and their need in building IoT
C03-PS03	M	Graduate attains information on basics of developing IoT related projects which can be contributed to the society.
C04-P01	L	Graduate achieves a basic insight on prototypes and operating system for IoT.
C04-P02	M	Graduate is able to analyze a problem and write solutions using arduino programming.
C04-P03	H	Graduate is able to develop solutions to complex problems using the given programming languages.
C04-PS01	M	Graduates achieves knowledge on writing programs using arduino.
C04-PS02	M	Graduates achieves knowledge on interoperability in IoT.
C05-P03	H	Graduate is made able to develop applications using arduino programming
C05-PS01	H	Graduate is made able to develop applications by integrating sensors and actuators using arduino.

**WEB SOURCE REFERENCES:**

1	<a href="https://www.sqs.com/resources/whitepaper-the-internet-of-things-and-getting-security-right.pdf">https://www.sqs.com/resources/whitepaper-the-internet-of-things-and-getting-security-right.pdf</a>
2	<a href="https://iotbusinessnews.com/white-papers/">https://iotbusinessnews.com/white-papers/</a>

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

✓ CHALK & TALK	✓ STUD. ASSIGNMENT	✓ WEB RESOURCES	
✓ LCD/SMART BOARDS	STUD. SEMINARS	✓ ADD-ON COURSES	

**ASSESSMENT METHODOLOGIES-DIRECT**

✓ ASSIGNMENTS	STUD. SEMINARS	✓ TESTS/MODEL EXAMS	✓ UNIV. EXAMINATION
STUD. LAB PRACTICES	STUD. VIVA	MINI/MAJOR PROJECTS	CERTIFICATIONS
ADD-ON COURSES	OTHERS		

**ASSESSMENT METHODOLOGIES-INDIRECT**

✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓ STUDENT FEEDBACK ON FACULTY (TWICE)
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	OTHERS

**Prepared by**  
**Ms.Jean P Johny**  
**(Faculty)**

**Approved by**  
**Dr.Neeba E.A**  
**(H.O.D)**



## Course Plan

Day	Topic
1.	Introduction to Internet, History of Internet, Internet Technology
2.	Basics of Internet, Classification of Internet
3.	Topologies, Applications
4.	Internet of Things and Related Future Internet Technologies
5.	Internet of things Vision, Towards the IoT universe, IoT today
6.	Internet Communication Technologies
7.	Networks and Communication, Processes, Data Management
8.	IoT related Standardization
9.	Protocol, Communication protocols
10.	Types of Communication protocols
11.	Addressing Schemes
12.	M2M Service layer Standardization, OGC Sensor Web for IoT
13.	IEEE and IETF,ITU-T
14.	Current trends in Internet: Internet of Everything
15.	Storages, Databases
16.	Cloud Technology: Introduction, How to implement cloud? Usage of cloud
17.	Scalable computing, Characteristics of cloud computing, Classifications
18.	Virtual machines, Virtualization technology

<b>19.</b>	Models of distributed and cloud computing
<b>20.</b>	Distributed computing
<b>21.</b>	Clustering, Grid Computing
<b>22.</b>	Service Oriented Architecture, Performance and Security
<b>23.</b>	Implementations of cloud computing
<b>24.</b>	IoT ,Characteristics, IoT Technology
<b>25.</b>	IoT as a Network of Networks
<b>26.</b>	IoT architecture
<b>27.</b>	IoT developments, Smart technology
<b>28.</b>	Smart devices
<b>29.</b>	Smart environment
<b>30.</b>	IoT components
<b>31.</b>	Embedded Technology Vs IoT
<b>32.</b>	Wireless Sensor Networks
<b>33.</b>	Aurdino, Raspberry pi
<b>34.</b>	Prototyping in IoT
<b>35.</b>	Communication in IoT
<b>36.</b>	Data handling in IoT
<b>37.</b>	Bluetooth low energy
<b>38.</b>	Operating Systems for Low-End IoT Devices

<b>39.</b>	Operating Systems for Low-End IoT Devices
<b>40.</b>	Operating Systems for Low-End IoT Devices
<b>41.</b>	Operating Systems for Low-End IoT Devices
<b>42.</b>	Bigdata versus IoT
<b>43.</b>	A cyclic model of Bigdata
<b>44.</b>	Cloud and IoT
<b>45.</b>	Data storage, Analysis and communication
<b>46.</b>	Classifications
<b>47.</b>	Characteristics of BigData, Types of Bigdata
<b>48.</b>	Real time situations, Bigdata tools
<b>49.</b>	A combined application of IoT
<b>50.</b>	Cloud and Bigdata in IoT
<b>51.</b>	Revision
<b>52.</b>	Revision

## **Assignment Questions**

### **Assignment 1**

1. Explain in detail:
  - a) Classification of Internet,
  - b) Topologies
  - c) Applications

### **Assignment 2**

1. Case Studies :
  - a) Connected vehicle
  - b) Activity Monitoring
  
2. Implementation –Integration of Sensors and Actuators with Arduino

# **CS468 Cloud Computing**

## COURSE INFORMATION SHEET

PROGRAMME: <b>INFORMATION TECHNOLOGY</b>	DEGREE: <b>B TECH</b>
COURSE: <b>CLOUD COMPUTING</b>	SEMESTER: <b>8</b> CREDITS: <b>3</b>
COURSE CODE: <b>CS468</b> REGULATION: <b>2016</b>	COURSE TYPE: <b>ELECTIVE</b>
COURSE AREA/DOMAIN: <b>CLOUD COMPUTING</b>	CONTACT HOURS: <b>3</b>
CORRESPONDING LAB COURSE CODE (IF ANY): <b>NA</b>	LAB COURSE NAME: <b>NA</b>

### SYLLABUS:

UNI T	DETAILS	HOURS
I	<b>INTRODUCTION TO VIRTUALIZATION</b> Virtual Machines and Virtualization Middleware – Data Center Virtualization for Cloud Computing – Implementation Levels of Virtualization – Virtualization Structures/Tools and Mechanisms– Virtualization of CPU – Memory – I/O Devices	7
II	<b>INTRODUCTION TO CLOUD COMPUTING</b> System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds – Cloud Computing and Service Models – Public – Private – Hybrid Clouds – Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) - Software-as-a-Service (SaaS)-Different Service Providers	8
III	<b>CLOUD ARCHITECTURE AND RESOURCE MANAGEMENT</b> Architectural Design of Compute and Storage Clouds – Public Cloud Platforms: GAE – AWS – Azure-Emerging Cloud Software Environments – Eucalyptus- Nimbus – Open Stack – Extended Cloud Computing Services – Resource Provisioning and Platform Deployment – Virtual Machine Creation and Management.	8
IV	<b>CLOUD PROGRAMMING</b> Parallel Computing and Programming Paradigms – Map Reduce –Twister – Iterative Map Reduce – Hadoop Library from Apache –Pig Latin High Level Languages- Mapping Applications to Parallel and Distributed Systems – Programming the Google App Engine – Google File System (GFS) – Big Table – Google’s NOSQL System	7
V	<b>SECURITY IN THE CLOUD</b> Security Overview – Cloud Security Challenges – Security -as-a-Service – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security –Application Security – Virtual Machine Security.	6

VI	<b>USING CLOUD SERVICES</b> Email Communications – Collaborating on To-Do Lists –Contact Lists – Cloud Computing for the Community- Collaborating on Calendars – Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Project Management -Word Processing – Databases	6
TOTAL HOURS		42

**TEXT/REFERENCE BOOKS:**

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Kai Hwang, Geoffrey C Fox, Jack J Dongarra: Distributed and Cloud Computing – From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers – 2012.
R1	Alex Amies, Harm Sluiman, Qiang Guo Tong and Guo Ning Liu: Developing and Hosting Applications on the cloud, IBM Press, 2012.
R2	George Reese: Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice), O’Reilly Publications, 2009.
R3	Haley Beard: Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing – applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
R4	James E. Smith and Ravi Nair: Virtual Machines: Versatile Platforms for Systems and Processes, Morgan Kaufmann, ELSEVIER Publication, 2006.
R5	John W Rittinghouse and James F Ransome: Cloud Computing: Implementation – Management – and Security, CRC Press, 2010.
R6	Michael Miller: Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson Education, 2009.
R7	Richard N. Katz: The Tower and The Cloud, Higher Education in the Age of Cloud Computing, 2008.
R8	Toby Velte, Anthony Velte and Robert Elsenpeter: Cloud Computing – A Practical Approach, TMH, 2009.

**COURSE OBJECTIVES:**

1	To impart the fundamentals of virtualization techniques.
2	To introduce concepts and security issues of cloud paradigm.
3	To introduce cloud computing-based programming techniques and cloud services.

**COURSE OUTCOMES:**

SNO	DESCRIPTION	Bloom's Taxonomy Level
468.1	The students will be able to identify the significance of implementing virtualization techniques.	Identify (Level 2)
468.2	The students will able to interpret the various cloud computing models and services.	Interpret (Level 3)
468.3	The students will able to compare the various public cloud platforms and software environments.	Compare (Level 2)
468.4	The students will able to apply appropriate cloud programming methods to solve big data problems.	Apply (Level 3)
468.5	The students will able to appreciate the need of security mechanisms in cloud.	Appreciate (Level 4)
468.6	The students will be able to illustrate the use of various cloud services available online.	Illustrate (Level 2)

**CO-PO AND CO-PSO MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS468.1	-	2	-	-	2	-	-	-	-	-	-	-	-	-	2
CS468.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CS468.3	-	2	-	-	2	-	-	-	-	-	-	-	-	-	1
CS468.4	-	2	2	-	2	-	-	-	-	-	-	-	3	-	2
CS468.5	-	2	-	-	-	-	-	-	-	-	-	-	-	2	2
CS468.6	-	2	-	-	-	-	-	-	-	-	-	-	1	-	3
CS468	1	2	2	-	2	-	-	-	-	-	-	-	2	2	2

LOW/MEDIUM/HIGH→1/2/3

**JUSTIFICATIONS FOR CO-PO MAPPING**

Mapping	LOW/MEDIUM/HIGH	Justification
CS468.1-PO2	M	Using basic concepts of computer engineering students can identify the concept of virtualization
CS468.1-PO5	M	Students can use the concept of virtualization to model various engineering activities



CS468.2-PO1	L	Students can understand the various cloud computing models
CS468.3-PO2	M	Can compare and understand the various public cloud platforms available and also their corresponding software environment
CS468.3-PO5	M	The knowledge of various cloud platforms and software environments can be used for developing modern IT solutions
CS468.4-PO2	M	Can analyze Big Data problems for developing potential solutions
CS468.4-PO3	M	Solutions can be developed for complex Big Data problems.
CS468.4-PO5	M	Cloud programming methods can be used in engineering activities
CS468.5-PO2	M	Appraise, correlate and conclude the need for Cloud Security mechanisms
CS468.6-PO2	M	Students can use the knowledge gained to work on various cloud applications
CS468.1-PSO3	M	By implementing virtualization techniques innovative IT solutions can be developed
CS468.2-PSO3	M	The understanding of various cloud computing models and services enable the students to develop solutions for the betterment of life
CS468.3-PSO3	L	Comparative knowledge of cloud platforms can be used for the planning, developing of solutions
CS468.4-PSO1	H	Students are acquiring cloud programming knowledge
CS468.4-PSO3	M	Cloud programming methods learnt can be used for providing better solutions
CS468.5-PSO2	M	Understanding of cloud security concepts can be used in the network design domain
CS468.5-PSO3	M	Appreciating and understanding the security need in cloud will help the students while providing IT solutions
CS468.6-PSO1	L	Using the knowledge of various cloud services, new algorithms can be designed, analyzed and developed
CS468.6-PSO3	H	Understanding of cloud based services enable the students to plan, develop, test and implement better solutions

**GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:**

S. NO	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Hands on workshop on Hadoop	Workshop	1,3,5
2	Cloud Implementation	Workshop	1,3,5

**TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:**

S. NO	TOPIC	PO MAPPING
1	Performance of Cloud	1,2,3
2	Cloud for HPC and HTC	1,3,5

**WEB SOURCE REFERENCES:**

1	<a href="https://csrc.nist.gov/publications/detail/sp/800-145/final">https://csrc.nist.gov/publications/detail/sp/800-145/final</a>
2	<a href="https://docs.aws.amazon.com/index.html?nc2=h ql doc#lang/en us">https://docs.aws.amazon.com/index.html?nc2=h ql doc#lang/en us</a>
3	<a href="https://docs.microsoft.com/en-in/azure/">https://docs.microsoft.com/en-in/azure/</a>
4	<a href="https://cloud.google.com/docs/">https://cloud.google.com/docs/</a>

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

<input checked="" type="checkbox"/> CHALK & TALK	<input checked="" type="checkbox"/> STUD. ASSIGNMENT	<input checked="" type="checkbox"/> WEB RESOURCES	
<input type="checkbox"/> LCD/SMART BOARDS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> ADD-ON COURSES	

**ASSESSMENT METHODOLOGIES-DIRECT**

<input checked="" type="checkbox"/> ASSIGNMENTS	<input type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
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<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS

**Prepared by****Mathews Abraham****Approved by****Dr. NEEBA E A  
HOD, DIT**

## Course Plan

SI.No	Day	Module	Topic
1	Day 1	1	<b>INTRODUCTION TO VIRTUALIZATION</b> Virtual Machines and Virtualization Middleware – Data Center
2	Day 2	1	Virtual Machines and Virtualization Middleware – Data Center
3	Day 3	1	Data Center Virtualization for Cloud Computing
4	Day4	1	Data Center Virtualization for Cloud Computing
5	Day 5	1	Virtualization for Cloud Computing – Implementation Levels of Virtualization
6	Day 6	1	Virtualization for Cloud Computing – Implementation Levels of Virtualization
7	Day 7	1	Virtualization Structures/Tools and Mechanisms– Virtualization of CPU – Memory – I/O Devices
8	Day 8	1	Virtualization Structures/Tools and Mechanisms– Virtualization of CPU – Memory – I/O Devices
9	Day 9	1	Virtualization Structures/Tools and Mechanisms– Virtualization of CPU – Memory – I/O Devices
10	Day 10	2	<b>INTRODUCTION TO CLOUD COMPUTING</b> System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds
11	Day 11	2	System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds
12	Day 12	2	System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds
13	Day 13	2	Cloud Computing and Service Models – Public – Private – Hybrid Clouds

14	Day 14	<b>2</b>	Cloud Computing and Service Models – Public – Private – Hybrid Clouds
15	Day 15	<b>2</b>	Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) - Software-as-a-Service (SaaS)- Different Service Providers
16	Day 16	<b>2</b>	Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) - Software-as-a-Service (SaaS)- Different Service Providers
17	Day 17	<b>2</b>	Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) - Software-as-a-Service (SaaS)- Different Service Providers
18	Day 18	<b>3</b>	<b>CLOUD ARCHITECTURE AND RESOURCE MANAGEMENT</b> Architectural Design of Compute and Storage Clouds
19	Day 19	<b>3</b>	Architectural Design of Compute and Storage Clouds
20	Day 20	<b>3</b>	Public Cloud Platforms: GAE – AWS – Azure Emerging Cloud Software Environments – Eucalyptus- Nimbus – Open Stack
21	Day 21	<b>3</b>	Emerging Cloud Software Environments – Eucalyptus- Nimbus – Open Stack
22	Day 22	<b>3</b>	-Emerging Cloud Software Environments – Eucalyptus- Nimbus – Open Stack
23	Day 23	<b>3</b>	Extended Cloud Computing Services – Resource Provisioning and Platform Deployment – Virtual Machine Creation and Management.
24	Day 24	<b>3</b>	Extended Cloud Computing Services – Resource Provisioning and Platform Deployment – Virtual Machine Creation and Management.
25	Day 25	<b>3</b>	Virtual Machine Creation and Management.

26	Day 26	<b>4</b>	<b>CLOUD PROGRAMMING</b> Parallel Computing and Programming Paradigms – Map Reduce –Twister – Iterative Map Reduce --
27	Day 27	<b>4</b>	Parallel Computing and Programming Paradigms – Map Reduce –Twister – Iterative Map Reduce
28	Day 28	<b>4</b>	Parallel Computing and Programming Paradigms – Map Reduce –Twister – Iterative Map Reduce
29	Day 29	<b>4</b>	Hadoop Library from Apache –Pig Latin High Level Languages- Mapping Applications to Parallel and Distributed Systems
30	Day 30	<b>4</b>	Hadoop Library from Apache –Pig Latin High Level Languages- Mapping Applications to Parallel and Distributed Systems System
31	Day 31	<b>4</b>	Programming the Google App Engine – Google File System (GFS)
32	Day 32	<b>4</b>	Big Table – Google’s NOSQL System
33	Day 33	<b>5</b>	<b>SECURITY IN THE CLOUD</b> Security Overview – Cloud Security Challenges
34	Day 34	<b>5</b>	Security Overview – Cloud Security Challenges
35	Day 35	<b>5</b>	Security -as-a-Service – Security Governance –
36	Day 36	<b>5</b>	Risk Management – Security Monitoring
37	Day 37	<b>5</b>	Security Architecture Design – Data Security – Application Security

38	Day 38	5	Security Architecture Design – Data Security – Application Security
39	Day 39	5	Virtual Machine Security.
40	Day 40	6	<b>USING CLOUD SERVICES :</b> Email Communications – Collaborating on To-Do Lists –Contact Lists
41	Day 41	6	Email Communications – Collaborating on To-Do Lists –Contact Lists
42	Day 42	6	Cloud Computing for the Community- Collaborating on Calendars – Schedules and Task Management
43	Day 43	6	Exploring Online Scheduling Applications – Exploring Online Planning and Task Management
44	Day 44	6	Exploring Online Scheduling Applications – Exploring Online Planning and Task Management
45	Day 45	6	Collaborating on Event Management – Project Management
46	Day 46	6	Word Processing – Databases
47	Day 47		<b>Revision 1 and 2 modules</b>
48	Day 48		<b>Revision 3 and 4 modules</b>
49	Day49		<b>Revision 5 and 6 modules</b>

## **Assignment Questions**

### **Assignment 1**

Perform a comparative study on the following Public Cloud Platforms: GAE, AWS, Azure, IBM Cloud.

1. Perform a comparative study on the Cloud Software Environments: Eucalyptus, Nimbus, Open Stack and Aneka

### **Assignment 2**

1. Discuss on the various cloud based applications – eg: Online databases, Online calendars, Online event management application etc.



**IT 492**

**MAIN PROJECT**

## COURSE INFORMATION SHEET

PROGRAMME: Information Technology	DEGREE: B.Tech
COURSE: Project	SEMESTER: S8      CREDITS: 6
COURSE CODE: IT492      REGULATION: 2016	COURSE TYPE: Core
COURSEAREA/DOMAIN: Engineering (AllBranches)	CONTACT HOURS: 18(Practical) Hours / Week
CORRESPONDING LAB COURSE CODE (IF ANY):NA	LAB COURSE NAME:NA

### SYLLABUS:

PHASE	DETAILS	HOURS
Course Plan	<p>In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester</p> <p>Review and finalization of the approach to the problem relating to the assigned topic.</p> <p>Preparing a detailed action plan for conducting the investigation, including team work.</p> <p>Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.</p> <p>Final development of product/process, testing, results, conclusions and future directions.</p> <p>Preparing a paper for Conference presentation/Publication in Journals, if possible.</p>	18 (10 Weeks)

	<p>Preparing a report in the standard format for being evaluated by the dept. assessment board.</p> <p>Final project presentation and viva voce by the assessment board including external expert.</p>	
Evaluation	<p><b>Maximum Marks : 100</b></p> <p>(i) Two progress assessments      20% by the faculty supervisor(s)</p> <p>(ii) Final project report                      30% by the assessment board</p> <p>(iii) Project presentation and viva voce      50% by the assessment board</p>	1 week
<b>TOTAL HOURS</b>		216

**COURSE PRE-REQUISITES: NIL**

**COURSE OBJECTIVES:**

1	To apply engineering knowledge in practical problem solving.
2	To foster innovation in design of products, processes or systems
3	To develop creative thinking in finding viable solutions to engineering problems

**COURSE OUTCOMES:**

Ref. No.	DESCRIPTION	Blooms Taxonomy Level
IT451.1	The students will be able to think innovatively on the development of components, products, processes or	Analyze (Level4)
IT451.	The student will be able to apply knowledge gained in solving real life engineering problems.	Analyze & Create

**CO-PO AND CO-PSO MAPPING**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
IT451.1	3		3		3	2	2	-	3	3	3	-	2	1	3
IT451.2	3	3	3	3	3	-	-	-	3	3	3	-	2		3

**JUSTIFICATIONS FOR CO-PO MAPPING**

<b>MAPPING</b>	<b>LOW/MEDIUM/HIGH</b>	<b>JUSTIFICATION</b>
IT451.1-P01	H	Students will apply the engineering knowledge to analyze a current topic of professional interest in the Information Technology field.
IT451.1-P03	H	Students will design and develop solutions for complex engineering problems by developing innovative components, products, processes and technology.
IT451.1-P05	H	Students shall learn the use of tools for innovation & creative thinking and modern modeling tools etc. for innovation and development of components, products and processes.
IT451.1-P06	M	Students shall also consider societal aspects like health, safety, legal and cultural in addition to functional aspects while innovating and developing components, products and processes.
IT451.1-P07	M	Students shall also consider environmental issues and the need for sustainable development while innovating and developing components, products and processes.
IT451.1-P09	H	Students shall develop individual skills as well as team & leadership skills while working in student groups.
IT451.1-P010	H	Students shall develop communication skills while presenting seminar before an audience.
IT451.1-P011	H	Students shall develop project management skills while working in groups and managing the development of components, products and processes.
IT451.1-PS01	M	Students shall also apply IT specific skills while developing components, products and processes.
IT451.1-PS02	L	Students shall develop software prototypes to prove their design as part of developing innovative products and solutions, though the full software development life cycle is not intended as part of this course.
IT451.1-PS03	H	Students shall also develop professional skills like research and entrepreneurship skills while working as a team to develop innovative products and solutions.

IT451.2- PO1	H	Students will apply the engineering knowledge while analyzing the problem requirements and arriving at workable design solutions.
IT451.2- PO2	H	Students shall develop strong problem analysis skills while identifying and analyzing problems and arriving at innovative solutions for problems.
IT451.2- PO3	H	Students shall design and develop innovative solutions after identifying and analyzing problems.
IT451.2- PO4	H	Students shall conduct user surveys & research and analyze complex data to arrive at conclusions as part of analyzing complex engineering problems.
IT451.2- PO5	H	Students shall use modern tools for problem identification and analysis.
IT451.2- PO9	H	Students shall develop individual skills as well as team & leadership skills while working in student groups.
IT451.2- PO10	H	Students shall develop communication skills while working in student groups.
IT451.2- PO11	H	Students shall develop project management skills while working in groups and managing the development of components, products and processes.
IT451.2- PS01	M	Students shall also apply IT specific skills while analyzing problems and arriving at workable design solutions.
IT451.2- PS03	H	Students shall also develop professional skills like research and entrepreneurship skills while working as a team to analyze problems and to arrive at workable design solutions.

**DELIVERY/INSTRUCTIONAL METHODOLOGIES:**

<input checked="" type="checkbox"/> CHALK & TALK√	<input checked="" type="checkbox"/> STUD. ASSIGNMENT√	<input checked="" type="checkbox"/> WEB RESOURCES√
<input checked="" type="checkbox"/> LCD/SMART BOARDS√	<input type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> DISCUSSIONS/ DEBATES√

**ASSESSMENT METHODOLOGIES-DIRECT:**

<input type="checkbox"/> <b>ASSIGNMENTS</b>	<input type="checkbox"/> <b>STUD. PRESENTATIONS</b> √	<input type="checkbox"/> <b>TESTS/MODEL EXAMS</b>	<input type="checkbox"/> <b>UNIV. EXAMINATION</b>
<input type="checkbox"/> <b>STUD. LAB PRACTICES</b> √	<input type="checkbox"/> <b>STUD. VIVA</b> √	<input type="checkbox"/> <b>PROJECT/SEMINAR REPORTS</b> √	<input type="checkbox"/> <b>CERTIFICATIONS</b> √
<input type="checkbox"/> <b>ADD-ON COURSES</b>	<input type="checkbox"/> <b>OTHERS</b> √		

**ASSESSMENT METHODOLOGIES-INDIRECT:**

<input type="checkbox"/> <b>ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)</b> √	<input type="checkbox"/> <b>STUDENT FEEDBACK ON FACULTY (ONCE)</b> √
<input type="checkbox"/> <b>ASSESSMENT OF MINI/MAJOR PROJECTS BY EXPERTS</b> √	<input type="checkbox"/> <b>OTHERS</b>

**Prepared by**

**Approved by**

**Dr. Lakshmi K.S**

**Dr. Neeba E.A (HOD)**

IT 492 PROJECT SCHEDULE

Week No.	Period	Activity	Documents to be submitted to the coordinator and guide
1	Week 1	I. Review and finalization of the approach/methodology to the problem relating to the assigned topic. II. Detailed requirement analysis and finalization of the software and hardware requirements. III. Preparing a detailed action plan for conducting the investigation, including team work.	Prepare detailed documentation on activity I, II, III in log book
2	Week 2	I. Software installation II. Decide anyone certification/online course and do register the course.	Previous week evaluation by Faculty incharges and guides and record the progress details in teachers log book
3	Week 3	I. Language study II. Front end design development III. Back end implementation	Prepare detailed documentation on activity I, II, III in log book
4	Week 4	I. Data collection and preparation/hardware implementation II. Module-1 implementation and testing	Prepare detailed documentation on activity I, II, III in log book Previous week evaluation
5	Week 5	I. Module-I demo	Intermediate evaluation by Internal Evaluation team
6	Week 6	I. Module-2 implementation and testing	Prepare detailed documentation on activity I and II in log book
7	Week 7	I. Module-3 implementation and testing	Prepare detailed documentation on activity I and II in log book Previous week evaluation
8	Week 8	I. Implementation of the remaining modules II. Integration testing	Prepare detailed documentation on activity I, II, III in log book



		III. Final development of product/process	Previous week evaluation
9	Week 9	I. Final product/process, testing, results, conclusions and future directions II. Final project demo	
10	Week 10	I. Project report preparation II. Conference/journal paper preparation III. Draft report submission including design	Submit to the guide
11	Week 11	I. Report correction II. Project ppt preparation III. Final presentation evaluation (internal)	Submit Draft copy of the complete report and PPT to the coordinator  Final evaluation by Internal Evaluation team
12	Week 12	I. Final report submission II. Final project presentation and viva voce (External Evaluation)	Submit final report to the coordinator