B. Tech. Computer Science & Engineering (Third Year)
Batch: 2017 -2021

Trimester – VII

Sr. No	Course Code	Name of Course	Category	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Th	Lab	CCA	LCA	ETT	Total
1	CS311	Computer Networks	PC	3	-	2	2	1	50	50	50	150
2	CS312	Database Management Systems	PC	3	-	2	2	1	50	50	50	150
4	CS313	Software Modeling & Design	PC	3	-	2	2	1	50	50	50	150
5	CS314	Theory of Computation	PC	3	1	-	3	-	100	-	50	150
5	CS315	Embedded and IOT Lab	PC	-	-	4	-	2	-	100	-	100
6	WPC 5	Indian Tradition, Culture & Heritage	WP	3	-	-	2	-	70	-	30	100
		Total :		15	1	10	11	05	320	250	230	800

**Assessment Marks are valid only if Attendance criteria are met

COURSE STRUCTURE

Course Code	**CS311**			
Course Category	**Professional Core**			
Course Title	**Computer Networks**			
Teaching Scheme and Credits **Weekly load hrs**	**L**	**T**	**Laboratory**	**Credits**
	3	**-**	**2**	**2 + 1 = 3**

Pre-requisites:

- C Programming
- Data and Mobile Communication

Course Objectives:

1. To understand the basic knowledge of network topologies, standards and protocols
2. To learn network layer protocols
3. To explore services offered by transport layer
4. To understand protocols of application layer

Course Outcomes:

After completion of the course the students will be able to :-

1. Analyze and apply different types of network topologies and standards
2. Apply the knowledge of network protocols to design and analyze networks
3. Identify and use transport layer based communication
4. Apply the standards and protocols learned for designing client server based applications

Mapping of COs to Programme Outcomes (Course Articulation Matrix)

	a	b	c	d	e	f	g	h	i	j	k	l
CO1	**3**	**1**										**1**
CO2			**2**	**1**	**2**		**2**					**1**
CO3			**2**	**1**	**2**		**1**					**1**
CO4			**3**	**2**	**2**						**1**	**2**

1: Low 2: Medium and 3: High

Course Contents:

1. Introduction and Medium Access Control.
2. Network layer.
3. Transport layer.
4. Application Layer .

Laboratory Exercises / Practical:

1. Configure network using Dynamic Host Configuration Protocol.
2. Virtual LAN, Packet Tracker
3. Subnetting
4. Distance Vector Algorithm
5. Network setup
6. TCP Socket
7. UDP socket

Learning Resources:

Text Books:

1. Tanenbaum A. S., 'Computer Networks', Pearson Education , 4th Edition, 2008, ISBN-978-81-7758-165-2
2. Behrouz A. Forouzan, 'Data Communications and Networking', 5th Edition, McGraw-Hill Publishing Company

Reference Books:

1. James F. Kurose and Keith W Ross 'Computer Networking, A Top-Down Approach', 5th Edition, Pearson Education, ISBN- 978-81-317-9054-0
2. W. Richard Stevens, Unix Network Programming, The Sockets Networking API, Vol 1, 3rd Edition, PHI Learning Pvt. Ltd., ISBN

Supplementary Reading:

1. William Stallings, 'Data and Computer Communications', 6th Edition, Prentice Hall of India Pvt.

Web Resources:

https://nptel.ac.in/courses/106105080/
https://nptel.ac.in/courses/106106091/

Weblinks:

https://nptel.ac.in/courses/106105081/
https://nptel.ac.in/courses/106105183/
https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-829-computer-networks-fall-2002/index.htm

MOOCs:

https://alison.com/course/diploma-in-computer-networking

Pedagogy:

- Power Point Presentation
- Two Teacher Method
- Video Lectures
- Flipped Classroom Activity
- Group Discussion
- Chalk and Board

Assessment Scheme:

Class Continuous Assessment (CCA)- 50 Marks

Assignments	Mid Term Test	Tutorial	MCQ	Attendance
30%	30%	-	30%	10%

Laboratory Continuous Assessment (LCA)-50 Marks

Performance of Experiment	Oral Exam	Site Visit	Mini Project	Any other	Attendance
60%	--	-	-	30%	10%

Term End Examination: 50 Marks (100% weightage)

Theory Syllabus:

Module No.	Contents	Workload in Hrs	
		Theory	Lab
1	**INTRODUCTION COMPUTER NETWORKS AND MEDIUM ACCESS CONTROL** Types of Networks (Introduction of LAN, MAN,WAN,PAN, Ad-hoc Network) Network Architectures: Client-Server, Peer-to-Peer, Distributed and SDN, OSI Model, TCP/IP Model. Network topologies, Network addressing (Physical address, IP address and Port address).Channel allocation, Multiple Access Protocols: ALOHA, CSMA/CD, CSMA/CA, Ethernet: Frame format, IEEE 802.3, Fast and Gigabit.	07	--
2	**NETWORK LAYER** Network Layer Design Issues, Internet Protocol: IPv4 and IPv6 addressing schemes, Subnetting, CIDR, NAT, ICMP, Routing Algorithms: Distance Vector, Link State, Routing Protocols: RIP, OSPF, BGP, Congestion control, Quality of Service.	08	--
3	**TRANSPORT LAYER** Transport Layer Services: Transport layer functionalities, Sockets, Transport Layer Protocols: UDP, RTP, TCP: 3- way Handshake, TCP Transmission Policy (Sliding Window), TCP Congestion Control Algorithms: Leaky Bucket, Token Bucket, Congestion Avoidance, Quality of Service .	07	--
4	**APPLICATION LAYER** Dynamic Host Control Protocol (DHCP), Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Simple Mail Transfer Protocol: POP3, IMAP, MIME. File Transfer Protocol (FTP), TELNET, Simple Network Management Protocol (SNMP).	08	--

Laboratory:-

Module No.	Contents	Workload in Hrs
1	Configure network using Dynamic Host Configuration Protocol (DHCP). Use Ping utility to test connectivity.	02
2	Design and configure a virtual LAN using Packet Tracer.	02
3	Write a (C++/Python/Java) program to implement subnetting to find subnet mask	04
4	Write a (C++/Python/Java) program to simulate Distance Vector Routing algorithm.	02
5	Set up a network - configure interfaces, IP addresses and routing protocols (RIP/OSPF/BGP) using Packet Tracer (Network Simulator)	02

6	Write a C program for wired network using TCP socket to demonstrate a)Message transfer from one machine to another machine. (50% students of the batch should implement) b) File transfer application / Mathematical operations. (Remaining 50% students of the batch should implement)	04
7	Write a C program for wired network using UDP socket to perform any one of the following operations a. String Conversion from Upper Case to Lower Case. b. Conversion from String to ASCII. c. Conversion from Hex to Decimal.	04

COURSE STRUCTURE

Course Code	**CS312**			
Course Category	**Professional Core**			
Course Title	**Database Management Systems**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	**3**	**------**	**2**	**2+1=3**

Pre-requisites:

- Discrete Structure
- Data Structures

Course Objectives:

1. Understand and successfully apply logical database design principles
2. Learn Database Programming languages and apply in DBMS application
3. Understand transaction processing and concurrency control in DBMS
4. Learn database architectures, DBMS advancements and its usage in advance application

Course Outcomes:

After completion of the course the students will be able to :-

1. Design ER-models to represent simple database application scenarios and improve the database design by normalization.
2. Design Database Relational Model and apply SQL, PLSQL concepts for database programming.
3. Describe Transaction Processing and Concurrency Control techniques for databases.
4. Identify appropriate database architecture for the real world database application.

Mapping of COs to Programme Outcomes (Course Articulation Matrix)

	a	b	c	d	e	f	g	h	i	j	k	l
CO1			**2**	**3**								**1**
CO2		**2**			**3**							**1**
CO3			**3**	**2**								**1**
CO4		**3**			**2**							**1**

1: Low, 2: Medium and 3: High

Course Contents:

1. Introduction to DBMS and Data Modelling
2. Database Languages and Programming
3. Transaction Management and Concurrency Control
4. Advanced techniques, Databases and applications

Laboratory Exercises / Practical:

1. ER Model
2. Introduction to MySQL :Database Modelling, DDL commands (Create, Alter, Drop, Truncate, Rename, Describe) DCL(Grant, Revoke), TCL(Rollback, Commit, Savepoint)
3. SQL Commands :DML(Insert, Update, Delete)
4. SQL Queries with Select command : Simple Select, Data Sorting, Subquery , Joins(Inner, Outer, Natural, Self), Group by-Having, Set Operations
5. PLSQL Procedures and Functions
6. PLSQL Triggers and Cursors
7. Mini Project: SQL-Java Connectivity (2 Tier)

Learning Resources:

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 6th Ed, McGraw Hill, 2010.
2. Elmasi, R. and Navathe, S.B., "Fundamentals of Database Systems", 4th Ed., Pearson Education.

Reference Books:

1. Ramakrishnan, R. and Gherke, J., "Database Management Systems", 3rd Ed., McGraw-Hill.
2. Connally T, Begg C.,"Database Systems",Pearson Education
3. Pang, N. T., Steinbach, M. and Kumar, V., "Introduction to Data Mining", Pearson Education.
4. MongoDB: The Definitive Guide by Kristina Chodorow
5. Big Data Analytics with R and Hadoop by Vignesh Prajapati

Supplementary Reading:

Chuck Lam, "Hadoop in action"

Web Resources:

Big Data: Principles and Paradigms – Rajkumar Buyya , Rodrigo N. Calheiros, Amir Vahid Dastjerdi [PDF Available online]

Web Links:

https://www.mysql.com/
http://www.oracletutorial.com/
https://www.mongodb.com/

MOOCs:

https://nptel.ac.in/syllabus/106106095/

Pedagogy:

- White Board
- Power Point Presentations
- Expert Lectures
- Blended Teaching Learning :Flipped Classroom, TPS, LBDs

Assessment Scheme:

Class Continuous Assessment (CCA):50 Marks

Assignments	Mid Term Test	Presentations	Case study	MCQ	Oral	Attendance
30%	30%	-	-	30%	-	10%

Laboratory Continuous Assessment (LCA):50 Marks

Practical Performance	Oral based on practical	Site Visit	Mini Project	Problem based Learning	Any other (Practical exam)
50%	-	-	10%	-	40%

Term End Examination: 50 Marks (100% weightage)

Theory Syllabus

Module No.	Contents	Workload in Hrs	
		Theory	Lab
1	**INTRODUCTION TO DBMS AND DATA MODELING** DBMS Vs File Systems, Database System Architecture, Data Abstraction, Data Independence, Data Definition and Data Manipulation Languages, Database System Internals-Components of a database system, Data Models , E-R diagram: Components of E-R Model, conventions, Keys, EER diagram Components, E-R diagram into tables, Relational Model, Relational Integrity, Referential Integrities, Enterprise Constraints, Schema Diagram, Relational Algebra- Basic Operations, Normalization, Functional Dependency, Normal Forms	**8**	--
2	**DATABASE LANGUAGES AND PROGRAMMING** Introduction to SQL, Characteristics and advantages of SQL, SQL Data Types, DDL Commands, DCL Commands. SQL Queries: DML Queries with Select Query Clauses, Creating, Modifying, Deleting. Views: Creating, Dropping, Updating, Indexes, SQL DML Queries, Set Operations, Predicates and Joins, Set membership, Grouping and Aggregation, Aggregate Functions, Nested Queries, PL/SQL Concepts: PL/SQL Functions and Procedures, Cursors, Database Triggers. Query Processing and Optimization.	**7**	--
3	**TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL** ACID properties, transactions, schedules and concurrent execution of transactions, Serializability: View, Conflict. Concurrency control lock based protocol (simple, 2 phase: Rigorous 2 phase, Strict 2 phase), Cascade-less Schedule, Recoverable Schedule, Deadlocks: Prevention Techniques (Wait Die, Wound Wait), Detection Techniques, Database Recovery: Failure classification Recovery and atomicity: Log-based recovery, Shadow paging.	8	--
4	**ADVANCED TECHNIQUES, DATABASES AND APPLICATIONS** Database Architecture: Centralized, Client-Server, Parallel, Distributed. Database Connectivity. Decision Support Systems: Introduction of Data Warehousing, Data Mining and Knowledge discovery, Business Intelligence. Big Data & NoSQL: Introduction, Application, Challenges, Hadoop, XML, JSON, Structured Vs Unstructured Databases, NoSQL Databases.	**7**	--

Laboratory:

Module No.	Contents	Workload in Hrs
		Lab
1	Case Study on ER	2
2	SQL- DDL commands(Create, Alter, Drop, Truncate Rename, Describe) ,DCL(Grant, Revoke)	2
3	SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation , NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE	2
4	SQL Queries on: Functions-Single Row, Aggregate Functions, Data Sorting, Subquery, Joins(Inner, Outer, Natural, Self), Group by-Having, Set Operations, View.TCL Commands (Rollback, Commit, Savepoint)	2
5	PLSQL Procedures and Functions	4
6	PLSQL Triggers and Cursors	4
7	Mini Project : SQL-Java Connectivity (2 Tier)	4

COURSE STRUCTURE

Course Code	**CS313**			
Course Category	**Professional Core**			
Course Title	**Software Modelling & Design**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	3	-	2	2+1=3

Pre-requisites:

- Software Engineering and Project Management

Course Objectives:

1. To specify, analyse and organise requirements for a software product.
2. To transform Requirement document to Appropriate design.
3. Apply appropriate UML diagrams and notations to design the product.
4. To understand the testing techniques in the software development.

Course Outcomes:

After completion of the course the students will be able to :-

1. Analyse the problem statement and choose proper design technique for designing application
2. Use a modelling language as a means to communicate realistic problems and their solutions.
3. Design and analyse an application using UML modelling as fundamental tool.
4. Identify different testing methodologies and its significance.

Mapping of COs to Programme Outcomes (Course Articulation Matrix)

Course Outcomes	Program Outcomes											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1		**2**									**1**	**3**
CO2		**3**			**1**							**2**
CO3		**3**		**1**	**3**			**3**			**2**	**3**
CO4		**2**			**2**			**2**				**2**

1: Low, 2: Medium and 3: High

Course Contents:

1. Introduction
2. Static Modeling
3. Dynamic Modelling
4. Testing

Laboratory Exercises/ Practical:

1. Use Case Diagram and Activity Diagram
2. Class Diagram and Object Diagram
3. Sequence Diagram and State Chart
4. Deployment Diagram
5. Test Case Preparation
6. Mini Project

Learning Resources:

Text Books:

1. Jim Arlow, Ila Neustadt, ―UML 2 and the unified process –practical object-oriented analysis and design‖ Addison Wesley, Second edition, ISBN 978-0201770605
2. Gopalaswamy Ramesh, Srinivasan Desikan, Software Testing: Principles and Practices, Pearson, ISBN: 9788177581218

Reference Books:

1. Gardy Booch, James Rambaugh, Ivar Jacobson, ―The unified modeling language user guide‖ , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8
2. Dan Pilone, Neil Pitman "UML 2.0 in a Nutshell", (In a Nutshell (O'Reiily)) paperback)

Web Resources:

https://www.pdfdrive.com/uml-uml-20-tutorial-e16736680.html

Web links:

http://www.mhhe.com/engcs/compsci/pressman/

MOOCs:

https://nptel.ac.in/courses/106105153/33
https://nptel.ac.in/courses/106105153/35

Pedagogy:

- Power Point Presentation
- White-board / Pen
- Two Teacher method

Assessment Scheme:

Class Continuous Assessment (CCA)- 50 Marks

Mid term test	Theory Assignment	Case study	MCQ	Attendance
30%	20%	10%	20%	20%

Laboratory Continuous Assessment (LCA)-50 Marks

Practical(Laboratory)	Oral	Site Visit	Mini Project	Problem based Learning	Any other (Mock 1 and Mock2)
60%	10%	-	10%	-	20%

Term End Examination: 50 Marks (100% weightage)

Theory Syllabus:-

Module No.	Contents	Workload in Hrs	
		Theory	Lab
1	**INTRODUCTION** Introduction to software design, Unified Process, From analysis to Design. Concept of Modelling , 4+1 view Architecture, Introduction to OMG standards MDA,UML 2.0, Introduction to UML -Basic building blocks, Extensibility mechanisms like stereotypes, tagged values, constraints.	07	
2	**STATIC MODELING** Class diagrams , Object diagrams, Composite structure diagrams, Package diagrams, Component Diagram - Interfaces and Components, Deployment Diagram	08	
3	**DYNAMIC MODELING** Use case diagram, Activity diagram, Advance state machine diagram, Interaction : Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram	08	
4	**TESTING** Testing concepts, Principles of software testing, verification and validation, V-test model, defect management Testing strategies, unit, integration and system testing , acceptance, alpha, beta, performance, security testing ,white box and black box testing, basis path testing, equivalence testing, graph base testing, Test cases and test plan	07	

Laboratory:-

Module No.	Contents	Workload in Hrs
1	For the given problem statement draw Use Case Diagram and Activity Diagram using Rational rose	04
2	For above problem statement draw Class Diagram and Object Diagram	04
3	For the same problem draw Sequence Diagram and State Chart	04
4	Draw Component Diagram and Deployment Diagram for the above problem statement	04
5	Write the test plan, test cases and generate test scripts using any automated testing tool	04
6	Mini Project	--

COURSE STRUCTURE

Course Code	**CS314**			
Course Category	**Professional Core**			
Course Title	**Theory of Computation**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	**3**	**2**	**-**	**2+1=3**

Pre-requisites:

- Discrete Structures

Course Objectives:

1. To understand the basics of automata theory and its operations.
2. To understand problem classification and problem solving by machines.
3. To study computing machines by describing, classifying and comparing different types of computational models.
4. To understand the fundamentals of decidability and computational complexity.

Course Outcomes:

After completion of this course students will be able:

1. To construct finite state machines to solve problems in computing.
2. To build mathematical expressions and syntax verification for the formal languages.
3. To construct and analyze Push Down Automata and Turing Machine for formal languages.
4. To classify the understanding of decidability and complexity.

Mapping of COs to Programme Outcomes (Course Articulation Matrix)

	a	b	c	d	e	f	g	h	i	j	k	l
CO1	1	2	3	2								1
CO2		3	3	2			1					1
CO3		3	3	2								1
CO4		3	3	3	1		1					1

1: Low 2: Medium and 3: High

Course Contents:

1. Formal Languages and Finite Automata
2. Regular Expression
3. CFG & PDA
4. Pushdown Automata
5. Turing Machine

Learning Resources:

Text Books:

1. John C. Martin, Introduction to Language and Theory of Computation, TMH, 3rd Edition, ISBN: 978-0-07-066048-9
2. Vivek Kulkarni, Theory of Computation, Oxford University Press, ISBN-13: 978-0-19-808458-7

Reference Books:

1. K.L.P Mishra, N. Chandrasekaran, Theory of Computer Science (Automata, Languages and Computation), Prentice Hall India, 2nd Edition.
2. Michael Sipser, Introduction to the Theory of Computation, CENGAGE Learning, 3rd Edition, ISBN:13:978-81-315-2529-6
3. Daniel Cohen, Introduction to Computer Theory, Wiley India, 2nd Edition, ISBN: 9788126513345
4. Kavi Mahesh, Theory of Computation: A Problem Solving Approach, 1st Edition, Wiley-India, ISBN: 978-81-265-3311-4

Supplementary Reading:

1. Hopcroft Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education Asia, 2nd Edition, ISBN: 9788131720479

Web Resources:

Michael Sipser, Introduction to the Theory of Computation, CENGAGE Learning, 3rd Edition, ISBN:13:978-81-315-2529-6 [PDF Available online]

Web links:

https://gatecse.in/theory-of-computation
https://www.youtube.com/watch?v=eqCkkC9A0Q4
https://www.youtube.com/watch?v=58N2N7zJGrQ
https://www.slideshare.net/Shiraz316/theory-of-computation-69977770

MOOCs:

https://onlinecourses.nptel.ac.in/noc19_ma15/course
https://onlinecourses.nptel.ac.in/noc17_cs34/preview

Pedagogy:

- Chalk and Board
- PPT
- Video Lectures
- Think-Pair-Share Activity
- Flipped Classroom Activity

Assessment Scheme:

Class Continuous Assessment (CCA): 50 Marks

Assignments	Mid Term Test	MCQ	Attendance
30%	30%	30%	10%

Tutorial : 50 Marks

Term End Examination: 50 Marks (100% weightage)

Theory Syllabus

Module No.	Contents	Workload in Hrs	
		Theory	Lab
1	**FORMAL LANGUAGES AND FINITE AUTOMATA** Introduction to Formal language, Basic concepts: Symbol, Alphabet, String, Introduction to Finite Automata, State transition graph, Transition table, Acceptance of a string, Acceptance of a Language, Deterministic finite Automata (DFA)-Formal Definition, Non Deterministic finite Automata (NFA)-Formal Definition, Non Deterministic finite Automata (NFA) with epsilon transition, Equivalence of NFA and DFA, Conversion from NFA to DFA, Conversion from NFA with epsilon transition to DFA, Minimization of FA, Finite Automata with output: Moore and Mealy Machine, Moore to Mealy conversion, Mealy to Moore conversion	9	--
2	**REGULAR EXPRESSION** Formal definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, FA and RE, DFA to RE Using Arden's Theorem, RE to DFA (RE to e-NFA to DFA and RE to DFA Direct Method), inter-conversion between Left Linear and Right linear Grammar, Closure properties of RLs, Pumping Lemma for RL, Applications of Regular Expressions	6	--
3	**CONTEXT FREE GRAMMAR(CFG) & PUSH DOWN AUTOMATA(PDA)** Formal definition of Grammar, Chomsky Hierarchy, CFG : Formal definition of CFG, Derivations, Parse Tree, Ambiguity in grammars and languages, Language Specification using CFG, Normal Forms: Chomsky Normal Form and Greibach Normal Form. Closure properties of CFL. Pushdown Automata : Definition, Acceptance of PDA by final State and Empty Stack, Designing PDA, Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata, Nondeterministic Pushdown Automata	8	--
4	**TURING MACHINE** Formal definition of a Turing Machine, Recursive Languages and Recursively Enumerable Languages, Design of Turing Machines, Universal Turing Machine, Nondeterministic Turing machines. Designing TM , Concept of Decidability, Un-decidability, Halting Problem of TM	7	--

COURSE STRUCTURE

Course Code	**CS315**			
Course Category	**Professional Core**			
Course Title	**Embedded And Internet of Things Laboratory**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**-**	**-**	**04**	**02**

Prerequisites:

- Basic Programming Logic
- Processor Architecture and Interfacing
- Computer Network Technology

Laboratory Objectives:

1. To understand IoT development boards and Operating systems
2. To understand sensor interfacing with development boards
3. To understand actuators interfacing with development boards
4. To understand architecture protocols to disseminate sensor data
5. To understand web and cloud technologies use to empower IoT applications
6. To understand integration and deployment issues through Mini real life IoT project

Laboratory Outcomes:

By the end of the course, students will be able to

1. Demonstrate IoT platforms and installations, such as Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
2. Demonstrate use of sensors with Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
3. Demonstrate use of actuators with Raspberry-Pi/Beagle board//Node MCU ESP/ Arduino.
4. Use protocols such as MQTT/ CoAP and tools to demonstrate architecture of IOT system.
5. Demonstrate cloud and database systems to log IoT data such as Amazon / Google / MySQL etc.
6. Proof of concept for real life social or business IoT project which displays abilities such as requirements, design, implementation, analysis and deployment concerns.

Laboratory Exercises/ Practical:

1. Study of IoT Architecture and ARM SOC installations
2. Interfacing Sensors
3. Interface Simple Actuators such as Stepper Motor
4. Traffic Control Using Raspberry-Pi
5. Obstacle Detection using IR Sensors
6. MQTT/COAP/XMPP protocol
7. Cloud System Interface
8. Web server installation and access in IoT platform

Learning Resources

Reference Books

1. Beginning Arduino by Micheal McRoberts Publishers: Technology in Action
2. IoT Fundamental by Devid Hanes Publishers: CISCO
3. Raspberry Pi Cookbook for Python Programmers by Tim Cox Publishers: PACKT
4. The Official RaspberryPi ProjectBook
5. Beginning Sensor Networks with Arduino and Raspberry Pi by Charles Bell Publishers: Technology in Action
6. The Internet of Things by Hakima Chaouchi Publishers: ISTE and Willey

Web Resources:

Web links:

https://gatecse.in/theory-of-computation
https://www.youtube.com/watch?v=eqCkkC9A0Q4
https://www.youtube.com/watch?v=58N2N7zJGrQ
https://www.slideshare.net/Shiraz316/theory-of-computation-69977770

MOOCs:

https://onlinecourses.nptel.ac.in/noc19_ma15/course
https://onlinecourses.nptel.ac.in/noc17_cs34/preview

Web Links for IoT Laboratory

https://www.tutorialspoint.com/internet_of_things/
http://raspberrypi.org/magpi
https://dzone.com/iot-developer-tutorials-tools-news-reviews
http://beagleboard.org/getting-started
https://randomnerdtutorials.com/getting-started-with-the-beaglebone-black/
http://www.toptechboy.com/beaglebone-black/
https://www.edureka.co/blog/iot-tutorial/
https://data-flair.training/blogs/iot-tutorials-home/
https://www.javatpoint.com/iot-healthcare
https://tutorials-raspberrypi.com/
https://core-electronics.com.au/tutorials/raspberry-pi-workshop-for-beginners.html
https://www.arduino.cc/en/Tutorial/HomePage?from=Main.Tutorials

Assessment Scheme:

Laboratory Continuous Assessment (LCA) 100 marks (100%)

Understanding and Performance of Experiment	Oral and Journal Submission	Attendance/ Discipline/ Ethics	Mini Project Demo and Presentation
30%	30%	10%	30%

Syllabus

Lab	Experiment Statement	Workload in Hrs
		Lab
1	Study of IoT architecture, development platforms and various ARM SOCs such as Raspberry Pi/ ESP8266 boards/ Beagle board/ Arduino Uno etc. To perform OS installations used to build IoT devices.	4
2	To Interface following sensors such as Temperature or Ultrasonic or Gas sensors with Raspberry-Pi/Beagle board/ Arduino etc. and display readings on console.	4
3	To interface simple actuators such as stepper motor, relays etc. with Raspberry Pi/ ESP8266 boards / Beagle board/ Arduino Uno.	4
4	Consider a suitable scenario of traffic signalling considering a crossroad and demonstrate traffic control using Raspberry-Pi/Beagle board/ Arduino etc.	4
5	To simulate an operation of obstacle detection and notifying it with buzzer or LED. You may additionally modify this to count objects entering the room	4
6	To demonstrate MQTT/COAP/XMPP protocols using message broker to subscribe and publish sensor data.	4
7	To sense the data from sensors and send it to cloud system in simple text files, excel sheets or databases system	4
8	To install web server such as Apache Web Server in IoT platform and write web application to access the server (IoT device as Web Server)	4
9	Mini Project: Real life IoT application Students are required to design and build a mini project for any suitable IoT application domains such as in the Healthcare, Manufacturing, Agriculture and Food, Insurance, Governance, Forest conservation, Transportation and Vehicles, Process management, Real estate and land records, Energy, Retails, Logistics, Education etc. Students should give the demonstration and prepare the 15-20 page plagiarism free report.	8