Shri Shankaracharya Technical Campus
(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekananda Technical University Bhilai)
SCHEME OF EXAMINATION AND SYLLABUS
B. Tech Third Year (5th semester)

Computer Science and Eng. (Internet of Things)

S.N	Board of Studies (BOS)	Courses (Subject)	Course Code	Periods per week			Scheme of Exam Theory/Practical			Total Marks	Credit
				L	T	P	ESE	CT	TA		
1	Comp. Sc. and Engineering	Theory of Computation	CS115501	2	1	-	100	20	30	150	3
2	Comp. Sc. and Engineering	Computer Network	CS115502	2	1	-	100	20	30	150	3
3	Comp. Sc. and Engineering	Data Science & Modeling	CS115503	2	1	-	100	20	30	150	3
4	Comp. Sc. and Engineering	IoT Development Boards	CS115504	2	1	-	100	20	30	150	3
5	Comp. Sc. and Engineering	Professional Elective-I		2	1	-	100	20	30	150	3
6	Comp. Sc. and Engineering	Computer Network Lab	CS115591	-	-	2	25	-	25	50	1
7	Comp. Sc. and Engineering	Data Science & Modeling Lab	CS115592	-	-	2	25	-	25	50	1
8	Comp. Sc. and Engineering	Internet of Things Lab	CS115593	-	-	2	25	-	25	50	1
9	Comp. Sc. and Engineering	Minor Project-I	CS115594	-	-	2	25	-	25	50	1
10	Comp. Sc. and Engineering	Practical Training/Internship (Reports and Seminar)	CS115595	-	-	2	-	-	25	25	1
11	Comp. Sc. and Engineering	Essence of Indian Knowledge and Tradition	CS115596	-	-	-	-	-	25	25	-
Total				13	2	10	600	100	300	1000	20

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

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SCHEME OF EXAMINATION AND SYLLABUS
B. Tech Third Year (5th semester)

Computer Science and Eng. (Internet of Things)

Table-I (Professional Elective-I)

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Credit
1	Comp. Sc. and Engineering	IoT Architecture and Security	CS115521	3
2	Comp. Sc. and Engineering	IOT System Design	CS115522	3
3	Comp. Sc. and Engineering	Object Oriented Modeling and Design	CS115523	3
4	Comp. Sc. and Engineering	Introduction to Block chain	CS115524	3
5	Comp. Sc. and Engineering	IOT Architecture & Protocol	CS115525	3

L-Lecture   T- Tutorial   P-Practical
CT- Class Test   TA- Teachers Assessment   ESE- End
Semester Exam

Subject Code CS115501	Theory Of Computation		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**	
	100	**20**	**30**	**150**	**3 Hours**	
	Minimum number of class tests to be conducted=02			**Minimum Assignments=02**		

Course Objectives	Course Outcomes
Formal languages and automata theory deals with the concepts of automata, formal languages, Grammar, computability and decidability. The reasons to study Formal Languages and Automata Theory are Automata Theory provides a simple, elegant view of the complex machine that we call a computer .More precisely, the objectives are: • To give an overview of the theoretical foundations of computer science from the perspective of formal languages. • To illustrate finite state machines to solve problems in computing. • To explain the hierarchy of problems arising in the computer sciences. • To familiarize Regular grammars, context frees grammar. • To solve various problems of applying normal form techniques, push down automata and Turing Machines	On successful completion of the course, the student will be able to: CO1.Design finite automata to accept a set of strings of a language. CO2.Determine whether the given language is regular or not. . CO3.Design context free grammars to generate strings of context free language. CO4.Design push down automata and the equivalent context free grammars and Design Turing machine. CO5.Distinguish between computability and non-computability, Decidability and un-decidability.

UNIT – I:The Theory Of Automata   **CO1**

Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator, Deterministic finite automata. Non-deterministic finite automata, finite automata with output (Mealy Machine. Moore machine), Finite automata with Epsilon moves, Minimizing number of states of a DFA, My hill Nerode theorem, Properties and limitation of FSM, Application of finite automata. **[8Hrs.]**

UNIT – II: Regular Expressions   **CO2**

Alphabet, String and Languages, Regular expression, Properties of RegularExpression, Finite automata and Regular expressions, Arden's Theorem, Regular Expression to DFA conversion &vice versa. Pumping lemma for regular sets, Application of pumping lemma, Regular sets and Regular grammar, Closure properties of regular sets. Decision algorithm for regular sets and regular grammar.

                                                                                                                                    [7Hrs.]

UNIT – III: Grammars   **CO3**

Definition and types of grammar, Chomsky hierarchy of grammar, Relation between types of grammars, Context free grammar, Left most & right most derivation trees, Ambiguity in grammar, Simplification of context free grammar, Chomsky Normal From, Greibach Normal From, properties of context free language, Pumping lemma for context free language, Decision algorithm for context tree language.

                                                                                                                                    [7Hrs.]

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UNIT – IV: Push Down Automata And Turing Machine   **CO4**

Basic definitions, Deterministic push down automata and non-deterministic push down automata, Acceptance of push down automata, Push down automata and context free language, Turing machine model, Representation of Turing Machine, Construction of Turing Machine for simple problem's, Universal Turing machine and other modifications .Church's Hypothesis, , Halting problem of Turing Machine. **[7Hrs.]**

UNIT – V: Computability   **CO5**

Introduction and Basic concepts, Recursive function, Partial recursive function, Initial functions, Composition of functions, Ackerman's function, Recursively Enumerable and Recursive languages,

Decidable and decidable problem, Post correspondence problem, Space and time complexity. **[7Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Theory of Computer Science (Automata Language & Computation)	K.L.P. Mishra and N. Chandrasekran	PHI
2	Introduction to Automata theory. Language and Computation	John E. Hopcropt & Jeffery D. Ullman	Narosa, Publishing House

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Introduction to Languages and the Theory of Computation	John Martin,	Tata McGraw Hill.
2	Introduction to Formal Languages Automata Theory and Computation	Kamala Krithivasan, Rama R	2nd Edition, Pearson Education.

Subject Code CS115502	Computer Network		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration	
	100	20	30	150	3 Hours	
	Minimum number of class tests to be conducted=02			**Minimum Assignments=02**		

Course Objectives	Course Outcomes
To Provide students with 0an enhanced knowledge in Computer Networking. • Understanding concept of local area networks, their topologies, protocols and applications. • Understanding the different protocols, and network architectures. • To make students understand the basic model of data communication and various concepts of networking.	On completion of this course the student will be able to: **CO1:** Describe the basis and structure of an abstract layered Network protocol model. **CO2:** understand the working of network protocols. **CO3:** Students will have deep understanding of various protocols used at Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control. **CO4:** Students will be able to analyze various Ethernet standards and will be able to choose an appropriate standard according to requirement of LAN. **CO5:** Students will be able to use various network based applications.

UNIT – I : Introduction :   **CO1**

History of Computer Network, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN, PAN,. Applications, networks architecture requirements, ISO-OSI, TCP/IP, XNS, IPX/SPX. **Physical Layer :** Transmission media, switching and encoding, asynchronous communications; Narrow band, broad band ISDN and ATM. Bandwidth calculation.   **[8Hrs]**

UNIT – II : Data link layer :   **CO2**

Design issues, framing, error detection and correction techniques with numerical, CRC, Elementary Protocol : stop and wait, Sliding Window, Slip, Data link layer in HDLC, ATM. Multiple Access Protocols, Link Layer Addressing, ARP, DHCP, Ethernet devices – Hubs, Bridges, and Switches. **Medium Access sub layer :** ALOHA, MAC addresses, CSMA, CSMA/CD. IEEE 802.XStandardEthernet,wireless LAN.

                                                                                                                          [8Hrs]

UNIT – III : Network Layer :   **CO3**

Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, Router, Routing Table, Internet Protocol (IP) – IPv4 and IPv6 , ICMP, Link State Routing , Distance Vector Routing, Hierarchical Routing , RIP, OSPF, BGP, Broadcast and Multicast Routing , MPLS, Mobile IP, IP sec. IPv4 : Classes, Classless, Subneting, Super netting and its numerical.   **[8Hrs]**

UNIT – IV : Transport Layer :   **CO4**

Transport Layer Services – Multiplexing and Demultiplexing, UDP –Go Back-N and Selective Repeat**. Connection-Oriented Transport**: TCP, Segment Structure, RTT estimation, Flow Control, Connection Management, Congestion Control, TCP Delay Modeling, SSL and TLS. QoS architecture models: IntServvsDiffServ.   **[8Hrs]**

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UNIT – V : Presentation Layer protocols :   **CO5**

   AFP, ICA, LPP, NCP, NDR, Telnet. **Session Layer protocols**: PAP, PPTP, RPC, SCP. **Application Layer**: Principles of Network Applications , The Web and HTTP, HTTPS, FTP, Electronic Mail, SMTP, IRC, Video Conferencing, MIME, DNS, Socket Programming with TCP and UDP. **Network Security:** Principles of Cryptography, Firewalls, Application Gateway, Attacks and Countermeasures.   **[8Hrs]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Communications and Networking	Behrouz A. Forouzan	Third Edition TMH
2	Computer Networking: A Top-Down Approach Featuring the Internet	James F. Kurose and Keith W. Ross	Pearson Education, Third edition, 2006

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Computer Networks	Andrew S Tanenbaum	4th Edition. Pearson Education/PHI
2	An Engineering Approach to Computer Networks	S.Keshav	2nd Edition, Pearson Education

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115503	Data Science And Modeling		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration	
	100	20	30	150	3 Hours	
	Minimum number of class tests to be conducted=02			**Minimum Assignments=02**		

Course Objectives	Course Outcomes
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Data Science **CO2**: Code using the python libraries needed for data science. **CO3** Demonstrate understanding of the mathematical foundations needed for data science. **CO4:** Collect, explores, clean, munge and manipulates data. **CO5** Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering. And Build data science applications using Python based toolkits.

UNIT I   CO1
Introduction to data science: Why Data Science, Benefits and uses of data science; Facets of data, The data science process: Setting up goal, retrieving data, data preparation, data exploration, data modeling, Presentation and automation.   **[8 Hrs.]**

UNIT II   CO2
Introduction to Programming: Sequence data: string, list, dictionary, array and tuple. Tools for Data Science, Toolkits using Python: Matplotlib, NumPy, Pandas, Scikit-learn, NLTK 2.2 3. Control structures if-then-else and loops, functions in python. Objects in python

Reading data and handling missing values: Pandas for data manipulation Working with data: Reading Files, (xlsx, csv, txt), creating copy, attribute of data, Indexing and selecting data , data types, summary of data, extracting unique element, Categorical and object data type, Converting data type, finding null values, Detecting missing values, approaches to fill missing values Data,, Rescaling, Dimensionality Reduction **[7 Hrs.]**

UNIT III   CO3
Exploratory Data Analysis and Data Visualization: Introduction to statistics used in data science, level of data : Nominal, ordinal, interval scale and ratio. Central tendencies (mean, median and mode), skewed data, data dispersion: range, interquartile range, variance, standard deviation, coefficient of variation.

Data visualization tools : matplotlib : scatter, histogram , bar. Seaborn library: box and whiskers plot, pairwise plot..   **[7 Hrs.]**

UNIT IV   CO4
Feature Engineering Data wrangling and tools for Data wrangling, Data transformation: converting categorical data into one hot encoding. Feature Selection, Feature Transformation, Dimensionality Reduction
                                                                                                                   [7 Hrs.]

UNIT V   **CO5**

Machine learning algorithm for building a model: Linear Regression- model assumptions, Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors: Confusion matrix recall precision and f-measure. Linear regression evaluation matric: mean square error with respect to case study **[7 Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media
2	Doing Data Science, Straight Talk From The Frontline	Cathy O' Neil and Rachel Schutt	O'Reilly
3	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman	Cambridge University Press

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Jeeva Jose	Khanna Publishers
2	Data Sciences	Jain V.K	Khanna Publishers
3	Big Data and Hadoop	Jain V.K	Khanna Publishers
4	Machine Learning	Chopra Rajiv	Khanna Publishers
5	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS111504	IoT Development Boards	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The objective of this course is to make students know the hands-on experience using different IoT architectures, to provide skills for interfacing sensors and actuators with different IoT architectures, to develop skills on data collection and logging in the cloud	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Arduino UNO. **CO2** To understand Arduino Uno connections with sensors . **CO3** To apply commonly used IOT protocols such as REST API, MQTT through IOT based demonstration. **CO4** To understand Raspberry PI along with critical protocols and its communication to cloud. **CO5** To solve analog sensor and digital sensor Interfacing with IOT devices.

UNIT – I : IoT- Introduction and its components   CO1

   IoT building blocks, Sensors and Actuators, IoT Devices, IoT boards (Arduino Uno, ESP 8266-12E Node MCU, and Raspberry Pi 3).   **[6 Hrs.]**

UNIT – II: Arduino Uno   CO1,CO2

getting started with the Uno boards, blink program, connection of sensors to the Uno board, reading values of sensors from the Uno board, interrupts. Case study: Temperature/Humidity Control; Case Study: Sending values Temperature/Humidity values to the Internet via GSM module **[6Hrs.]**

UNIT – III: ESP 8266-12E Node MCU   CO2,CO3

getting started with the ESP board, Micropython and Explorer IDE, Flushing the ESP8266 board with micropython, connecting sensors to the ESP board, Connecting ESP board to WiFi, Interfacing ESP with the Cloud (REST API-GET, POST, MQTT), interrupts, comparison of ESP 32 board with the ESP 8266 board. Case Study: Switching light on /off remotely. Case Study: Voice-based Home Automation for switching lights on/off (Android phone – Google Assistant (Assistant <-> IFTTT), MQTT (ESP <-> IFTTT), ESP 8266 <-> Lights).   **[10 Hrs.]**

UNIT – IV: Raspberry Pi 3   CO4

  Rpi3 introduction and installing the Raspbian Stretch OS, Headless - Computer and Rpi3 configuration to connect through SSH via Ethernet, Headless - connecting Rpi3 remotely without Ethernet cable via SSH, IP address, Rpi 3 - Testing the GPIO pins through Scripts   **[10 Hrs.]**

UNIT – V Raspberry pi3 interfacing with Sensor   CO5

 DHT11, Raspberry pi3 python library install and reading sensor feed, 'Plug and play ' type cloud platform overview for integration to IOT devices, 'Plug and play' cloud platform for integration to IOT device - actuator (LED), Plug and play platform - Custom widget (DHT11-Sensor) integration through Python. New - Raspeberry Pi 4 Vs Raspberry Pi3 Mobel B Comparison, LoRawan /LPWAN – Overview .**[6 Hrs.]**

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Text Books:

S.No.	Title	Author(s)	Publisher
1	Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects 2018	Rao, M.	Packt Publishing Ltd
2	Arduino for beginners: essential skills every maker needs 2013	Baichtal, J.	Pearson Education.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with ESP8266 (2016)	Schwartz, M.	Packt Publishing Ltd
2	Getting started with raspberry PI (2012)	Richardson, M., & Wallace, S.	O'Reilly Publisher Media, Inc

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS111591	Computer Network Lab	L =0	T = 0	P = 2	Credits = 1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 Hours

Course Objectives	Course Outcomes
To Provide students the basic knowledge of Computer Networking, tools used, their purpose and their connectivity based on requirements.	On completion of this course the student will be able to setup and configure various networking hardware and software. They will also be able to identify the basic faults and can resolve.

List of experiments to be conducted in Computer Network Lab.

1. Introduction to cables, connectors and topologies.
2. Demonstration of Switch, Hub, Router and their uses and types.
3. Installation of UTP, Co-axial cable, Cross cable, parallel cable.
4. Case Study of Ethernet (10base5,10base2,10 base T)
5. Case Study of various Wireless technologies available.
6. Basic network command and Network configuration commands like ping, netstat, hostname, nslookup, route, arp, tracert, ipconfig, ARP etc.
7. To enable secured / unsecured file sharing, device sharing over network.
8. Installation and working of Remote Desktop and other third party related software's.
9. To setup IP and other values avoiding DHCP.
10. Use of Subnet mask to create two or more different logical network in same lab.
11. Installation and working with IIS Server.
12. Basic Configuration of Home Router/Modem
13. Introduction to Server administration.
14. Basic Chat Program in Java using TCP.
15. Basic Chat Program in Java using UDP.

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Networking Bible	Barrie Sosinsky		Wiley
2	Network Programmability and Automation	Jason Edelman		O'Reilly
3	Subnetting for Beginners: How to Easily Master Ip	Adam Vardy		Amazon
4	Networking Made Easy: Get Yourself Connected	James Berstein		

Subject Code CS111592	Data Science And Modeling Lab	L = 0	T = 0	P = 2	Credits =1
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 hours

Course Objectives	Course Outcomes
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Data Science **CO2** Demonstrate understanding of the mathematical foundations needed for data science. **CO3** Collect, explore, clean, manage and manipulate data. **CO4** Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering. **CO5** Build data science applications using Python based toolkits.

List of Experiments

1. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy.
2. Write programs to understand the use of Numpy's Structured Arrays, Reading and Writing Array Data on Files.
3. Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts.
4. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts
5. Write programs to understand the use of Numpy's Shape Manipulation, Array Manipulation, vectorization.
6. Write a program in Python to predict the class of the flower based on available attributes.
7. Write a program in Python to predict if a loan will get approved or not.
8. Write a program in Python to predict the traffic on a new mode of transport.
9. Write a program in Python to predict the class of user.
10. Write a program in Python to indentify the tweets which are hate tweets and which are not.
11. Write a program in Python to predict the age of the actors.
12. Mini project to predict the time taken to solve a problem given the current status of the user

Text Books:

S.No.	Title	Author(s)	Publisher
1	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	Eric Matthes	William Pollock
2	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Machine Learning	Jeeva Jose	Khanna Publishers
2	Data Sciences	Jain V.K	Khanna Publishers
3	Fluent Python	Luciano Ramalho	O'Reilly Media
4	Machine Learning	Chopra Rajiv	Khanna Publishers

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115593	Internet of Things Lab	L = 0	T = 0	P = 2	Credits = 1
Examination Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**

Course Objectives	Course Outcomes
The objective of this course is to To give students hands-on experience using different IoT architectures, to provide skills for interfacing sensors and actuators with different IoT architectures and to develop skills on data collection and logging in the cloud	**On successful completion of the course, the student will be able to:** **CO1** Basic Concepts of Arduino UNO. **CO2** To understand Arduino Uno, NODE MCU 8266 and Raspberry PI along with critical protocols and its communication to cloud. **CO3** Students will be capable to design IoT applications in different domain and be able to analyze their performance. **CO4** To solve analog sensor and digital sensor Interfacing with IOT devices. **CO5** Build IOT applications using Arduino UNO Raspberry PI.

List of Experiments

1. Measure the Distance Using Ultrasonic Sensor and Make Led Blink Using Arduino
2. Detect the Vibration of an Object Using Arduino
3. Sense the Available Networks Using Arduino.
4. LDR to Vary the Light Intensity of LED Using Arduino.
5. Interact with DHT11 sensor with NodeMCU and compose a program to print temperature and humidity reading on screen.
6. Compose a program on NodeMCU to transfer temrature and stickness information to thingspeak cloud
7. Communicate OLED with NodeMCU and compose a program to print temperature and misture reading on it.
8. Switch Light On and Off Based on the Input of User Using Raspberry Pi
9. MySQL Database Installation in Raspberry Pi
10. SQL Queries by Fetching Data from Database in Raspberry Pi
11. Study of AT89S52 Ultra Development Kit with Development Tool /Environment of Kiel Software for Microcontroller programming.
12. To familiarize with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code.
13. Wifi module interfacing with Intel Galileo Gen2 Board.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects 2018	Rao, M.	Packt Publishing Ltd
2	Arduino for beginners: essential skills every maker needs 2013	Baichtal, J.	Pearson Education.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Internet of Things with ESP8266 (2016)	Schwartz, M.	Packt Publishing Ltd
2	Getting started with raspberry PI (2012)	Richardson, M., & Wallace, S.	O'Reilly Publisher Media, Inc

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Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115594	Minor Project-I	L = 0	T = 0	P =2		Credits = 1
Evaluation Scheme	ESE	CT	TA	-		ESE Duration
	25	-	25	-		3 Hours

Course Objective	Course Outcomes
The objectives of this lab are: The objective of this course is to improve student 's ability to analyze, design and solve complex engineering problems through pedagogies **(Project Based Learning)** that support them in developing these skills. The goal here is not to passively absorb and reiterate information; but rather to actively engage with the content, work through it with others, relate to it through an analysis, use modern tools and effectively solve problems with the corresponding knowledge gained.	**On successful completion of the course, the student will be able to:** **CO1:** Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. **CO2:** Reproduce, improve and refine technical aspects of engineering projects applying appropriate techniques, resources, and modern engineering and IT tools. **CO3:** Work as an individual and as a member or leader in teams in development of technical projects. **CO4:** Follow management principle and value health, safety and ethical practices during project. **CO5:** Communicate and report effectively project related activities and findings.

The Process Followed to Maintain the Quality of Student Projects are: [12 Hrs.]

 (a) Allotment of Projects:

(i) Students form their team (max four students) and submit their areas in which they would like to pursue their projects.

(ii) Through meeting and deliberations students are allotted guide depending on their preference and maximum number of groups under a faculty is limited to three.

 (b) Identification of projects:

Students are asked to formulate problem statement and state objectives of their project in consultation with the project guide

 c) Continuous Monitoring

(i) Progress is continuously monitored by guide and instructions are given how to proceed further during their project periods as per time table.

(ii) Students submit weekly progress report to the project in-charge after consultation with their project guide.

 (d) Evaluation

(i) In order to evaluate projects two project seminars (assessment) are taken in which student 's team present their project through presentations and demonstrate their work.

(ii) Students are assessed on the basis of their technical skill implementation, use of modern tools, communication skill, team work, health, safety and ethical practices and relevance of the project.

(iii) At the end of the semesters a report is submitted by the students and student 's projects are finally evaluated by external examiner in end semester practical examination based

Reference Books:

S. No.	Title	Authors	Publisher
1	Basics Of Project Management	IES Master Team	IES Master Publication
2	Modern Systems Analysis and Design	Jeffrey A. Hoffer, Joey F. George, Joseph S. Valakati	Pearson Education

Subject Code CS115521	IoT Architecture and Security	L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
The objective of this course is to make students know the IoT ecosystem,to provide an understanding of the technologies and the standards relating to the Internet of Things,to develop skills on IoT technical planning	On successful completion of the course, the student will be able to: **CO1** Basic Concepts of Internet of Things **CO2** To understand the technology and standards relating to IoTs. . **CO3** To understand the critical ecosystem required to mainstream IoTs . **CO4** understand the IOT Applications for value creations. **CO5**. To Acquire skills on developing their own national and enterprise level technical strategies.

UNIT – I : IoT & Web Technology   CO1

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics . **[6 Hrs.]**

UNIT – II: M2M to IoT   CO2

A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, an emerging industrial structure for IoT, the international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations **[6Hrs.]**

UNIT – III: IoT Architecture   CO3

State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.**[10 Hrs.]**

UNIT – IV: IoT Applications   CO4

for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth **[10 Hrs.]**

UNIT – V Internet of Things Privacy, Security and Governance   CO5

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smart Approach. Data Aggregation for the IoT in Smart Cities, Security .**[6 Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Abusing the Internet of Things	Nitesh Dhanjani	Shroff Publisher/O'Reilly Publisher
2	Internet of Things	RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan	John Wiley and Sons
3	Getting Started with the Internet of Things	Cuno Pfister	Shroff Publisher/Maker Media

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything 1 st Edition	Francis daCosta	Apress Publications
2	Make: Getting Started with the Arduino	Massimo Banzi, Michael Shiloh	Shroff Publisher/Maker Media Publishers.

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115522	IOT System Design		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE		CT	TA	Total	ESE Duration
	100		20	30	150	3 Hours
	Minimum number of class tests to be conducted=02				**Minimum Assignments=02**	

Course Objectives	Course Outcomes
The objective of this course is to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the IoT Platform and System Design. The course focuses on understanding the vision of IoT from a global perspective, understand its applications, determine its market perspective, using gateways, devices and data management, building a state of art architecture in IoT and its applications in commercial building automation and real world design constraints	On successful completion of the course, the student will be able to: **CO1** Core technologies of IOT development. **CO2** To understand the role of IOT and its Design Principles. **CO3** To Understand the IOT architecture. **CO4** To understand the IOT applications. **CO5** IOT security issues and case studies.

 UNIT – I :   IoT Networking   CO1
   Core Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wireless networking equipment and configurations, accessing hardware and device file interactions.**[6 Hrs.]**

UNIT – II: M2M to IoT Role   CO2
M2M in IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations **[6Hrs.]**

 UNIT – III: IoT Architecture   CO3
State of the Art IoT reference Model and Architecture- Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, Middleware Introduction-FiWare etc., Remote monitoring and sensing, remote controlling and performance analysis, layering concepts, communication pattern, 6LoWPAN, Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)**[10 Hrs.]**

 UNIT – IV: IoT Application Development   CO4
   Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development**[10 Hrs.]**

 UNIT – V IoT Security and case studies Security   CO5
   Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities .**[6 Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	"Internet of Things (A Hands-on-Approach)", 1 st Edition,2014	Vijay Madisetti and ArshdeepBahga	VPT
2	"Designing the Internet of Things", November 2013	Adrian McEwen, Hakim Cassimally	John Wiley and Sons.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition,2013	Francis daCosta	Apress Publications
2	Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems	Dr. Peter Friess	River Publishers

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115523	Object Oriented Modeling and Design	L =2	T =1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	**20**	**30**	**150**	**3 Hours**
	Minimum number of class tests to be conducted=02			**Minimum Assignments=02**	

Course Objectives	Course Outcomes
The objective of this course is to build an object-oriented model for a project using UML, gain practical knowledge in the UML diagrams and notations, understand the basic steps of Object Oriented Analysis and Design	On successful completion of the course, the student will be able to: **CO1 A**pply the OO concepts abstraction, encapsulation, inheritance, hierarchy, modularity, and polymorphism to the development of a robust design model. **CO2** Use the UML to represent the design model . **CO3** Apply an iterative, use case-driven process to the development of a robust design model . **CO4** Understand basic object-oriented concepts for designing a solution . **CO5** Design a software system using object-oriented software engineering paradigm .

UNIT – I :   Introduction and Modeling Concepts: **CO1**
What is Object-Orientation?, What is Object-Oriented Development?, Object-Oriented themes, Evidence for usefulness of Object-Oriented Development, OO Modeling history. Modeling Concepts: Modeling as design technique-Modeling, Abstraction, The three Models. Class Modeling- Object andClass,Links and Associations Concepts. Generalization and Inheritance, A Sample Class Model, Navigation of Class Models. AdvancedClass Modeling –Advanced Objects and Class Concepts, Association ends, N-array associations, Aggregation, Abstract Classes, Multiple Inheritance, Metadata, Reification, Constrains, Derived Data, and Packages.
.**[6 Hrs.]**

UNIT – II: State Modeling and Interaction Modeling   **CO2**
State Modeling- Events and States, Transition & Conditions, State diagrams, Statediagram behavior, Nested State diagrams, Concurrency. Advanced State Modeling- Nested State diagram, Nested States, SignalGeneralization, Concurrency, A Sample State Model, Relation of Class and State Models. Interaction Model- Use Case Models, Sequence Models, Activity Models. Advanced Interaction Modeling- Use Case relationships, Procedural Sequence Models, SpecialConstructs for activity Models. **[6Hrs.]**

UNIT – III: Analysis and Design: Process Overview   **CO3**
Development Stages, Development Life cycle. System Conception- DevelopingaSystemconcept, Elaborating a Concept, Preparing a Problem statement. Domain Analysis- Overview of Analysis, Domain Class Model, Domain State Model, Domain Interaction Model, Iterating and Analysis. Application Analysis- Application InteractionModel, Application Class Model, Application State Model, Adding Operations[**10 Hrs.**]

UNIT – IV: System design and class Design   **CO4**
System design: Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identifying Concurrency, Allocating Subsystems, Management of Data Storage, Handling Global Resources, Choosing Software Control Implementation, Handling Boundary Conditions, Setting Trade-off Priorities, Common Architectural Styles, Architecture of the ATM System. Class design: Overview of Object Design, Bridging the gap, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance, Organizing a Class Design, ATM Example**[10 Hrs.]**

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UNIT – V Implementation   **CO5**

Implementation Modeling- Overview of Implementation, fine-tuning classes, Fine tuning generalizations, realizing Associations, Testing. OO Languages- Introduction, Abbreviated ATM Model, Implementing Structure, Implementing Functionality. Databases- Introduction, Abbreviated ATM Model, Implementing Structure-basic and advanced, Implementing Structure for the ATM Example, Implementing functionality, OO Databases. Programming Style-OO Style, Reusability, Extensibility, Robustness, Programming in-the-large.**[6 Hrs.]**

Text Books:

S.No.	Title	Author(s)	Publisher
1	Object – Oriented Modeling and Design with UML	Michael R Blaha and James R Rumbaugh, 2 nd Edition	Pearson Education, India
2	Object oriented systems development	Ali Bahrami	McGraw-Hill Higher Education.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Object Oriented Analysis & Design	Atul Kahate	Tata McGraw-Hill Education
2	Object-Oriented Analysis and Design with Applications, Third Edition	Grady Booch, Robert A. Maksimchuk Michael W. Engle, BobbiJ.Young, Ph.D., Jim Conallen, Kelli A. Houston	Tata McGraw-Hill Education

Subject Code CS114424	Introduction to Block chain		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE		CT	TA	Total	ESE Duration
	100		20	30	150	3 Hours
	Minimum number of class tests to be conducted=02				**Minimum Assignments=02**	

Course Objectives	Course Outcomes
This course is intended to study the basics of Blockchain technology. During this course learner will explore various aspects of Blockchain technology like application in various domains. By implementing learner will have idea about private and public Blockchain, and smart contract	On successful completion of the course, the student will be able to: **CO1** Understand and explore the working of Blockchain technology (Understanding). **CO2** Analyze the working of Smart Contracts (Analyze) . **CO3** Understand and analyze the working of Ethereum **CO4** Understand and analyze the working of Hyperledger (Analyze). **CO5** Apply the learning of and de-centralized apps on Ethereum (Apply). .

UNIT – I : Introduction of Cryptography and Blockchain : **CO1**
What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions And Blocks, P2P Systems, Keys As Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.
.**[6 Hrs.]**

UNIT – II: BitCoin and Cryptocurrency **CO2**
What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain And Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency. **[6Hrs.]**

UNIT – III: Introduction to Ethereum **CO3**
What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Metamask Setup, Ethereum Accounts, Receiving Ether's What's a Transaction?, Smart Contracts [**10 Hrs.**]

UNIT – IV: Introduction to Hyperledger **CO4**
What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer **[10 Hrs.]**

UNIT – V Solidity Programming: **CO5**
Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address) Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins .**[6 Hrs.]**

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Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Text Books:

S.No.	Title	Author(s)	Publisher
1	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder	Princeton University Press
2	Mastering Ethereum	Antonopoulos and G. Wood	Princeton University Press.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Blockchain Basics,2017	D. Drescher	Apress,

			1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Subject Code CS115525	IOT Architecture & Protocol		L = 2	T = 1	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total		ESE Duration
	100	20	30	150		3 Hours
	Minimum number of class tests to be conducted=02			**Minimum Assignments=02**		

Course Objectives	Course Outcomes
The objective of this course is to To study the fundamentals about IoT,to study about IoT Access technologies,to study the design methodology and different IoT hardware platforms,to study the basics of IoT Data Analytics and supporting services,to study about various IoT case studies and industrial applications.	On successful completion of the course, the student will be able to: **CO1** Understand the basics of IoT . **CO2** Implement the state of the Architecture of an IoT . **CO3** Understand design methodology and hardware platforms involved in IoT . **CO4** Understand how to analyze and organize the data . **CO5** Compare IOT Applications in Industrial & realworld .

 UNIT – I :   FUNDAMENTALS OF IoT :   **CO1**
    Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.**[6 Hrs.]**

UNIT – II: IoT PROTOCOLS   **CO2**
IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT. **[6Hrs.]**

UNIT – III: DESIGN AND DEVELOPMENT   **CO3**
Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details [**10 Hrs.**]

 UNIT – IV: DATA ANALYTICS AND SUPPORTING SERVICES   **CO4**
    Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models. **[10 Hrs.]**

UNIT – V   CASE STUDIES/INDUSTRIAL APPLICATIONS   **CO5**
    IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.**[6 Hrs.]**

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Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Text Books:

S.No.	Title	Author(s)	Publisher
1	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry	Cisco Press, 2017
2	Internet of Things – A hands-on approach	Arshdeep Bahga, Vijay Madisetti	Universities Press.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	The Internet of Things – Key applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley	Tata McGraw-Hill Education
2	Object-Oriented Analysis and Design with Applications, Third Edition	Grady Booch, Robert A. Maksimchuk Michael W. Engle, BobbiJ.Young, Ph.D., Jim Conallen, Kelli A. Houston	Tata McGraw-Hill Education