Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus

Third Year B.Tech

in

Computer Science and Engineering (IoT and Cyber Security with Blockchain Technology) (Semester VI)

Prepared by:- Board of Studies in Computer Science & Engineering (IoT and Cyber Security with Blockchain Technology)

With effect from the Academic Year: 2023-2024

Scheme for Third Year B. Tech. in IoT and Cyber Security with Blockchain Technology Semester VI (Autonomous) (Academic Year 2023-2024)

Sr No	Course Code	Course	Teaching Scheme (hr)			Continuous Assessment (A)			Semester End Examination (B)				Aggregate (A + B)
			T	P/Tut	Credit	Th	T/W	Total CA (A)	Th	O	O & P	Total SEA (B)	
1	DJ19ICC601	Security in Computing	3	--	3	25	--	25	75	--	--	75	**100**
	DJ19ICL601	Security in Computing Laboratory	--	2	1	--	25	25	--	25	--	--	**50**
2	DJ19ICC602	Cryptocurrency Technology	3	--	3	25	--	25	75	--	--	75	**100**
	DJ19ICL602	Cryptocurrency Technology Laboratory	--	2	1	--	25	25	--	25	--	25	**50**
3 @ Any 1 Core Elective	DJ19ICEC6011	Machine Learning	3	--	3	25	--	25	75	--	--	75	**100**
	DJ19ICEL6011	Machine Learning Laboratory	--	2	1	--	25	25	--	25	--	25	**50**
	DJ19ICEC6012	Mobile Device Security and Forensics	3	--	3	25	--	25	75	--	--	75	**100**
	DJ19ICEL6012	Mobile Device Security and Forensics Laboratory	--	2	1	--	25	25	--	25	--	25	**50**
	DJ19ICEC6013	IoT Architecture and Protocols	3	--	3	25	--	25	75	--	--	75	**100**
	DJ19ICEL6013	IoT Architecture and Protocols	--	2	1	--	25	25	--	25	--	--	**50**
4	DJ19IHC1	Universal Human Values	2	--	2	25	--	25	75	--	--	75	**100**
	DJ19IHT1	Universal Human Values Tutorial	--	1	1	--	25	25	--	--	--	--	**25**
#5	DJ19IHL2	Professional and Business Communication Laboratory	--	4	2	--	50	50	--	--	--	--	**50**
6	DJ19ICL603	Skill Based Course Laboratory (UI/UX Lab)	--	2	1	--	25	25	--	--	25	25	**50**
7	DJ19ILL2	Innovative Product Development IV	--	2	1	--	25	25	--	25	--	25	**50**
		Total	**14**	**17**	**19**	**100**	**200**	**300**	**300**	**100**	**25**	**550**	**725**

@ Any 1 elective course

2 hrs. of theory (class wise) and 2 hrs of activity based laboratory (batch wise)

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech.** **Semester: VI**

Course: Security in Computing (DJ19ICC601)

Course: Security in Computing Laboratory (DJ19ICL601)

Prerequisite:

1. Computer Networks
2. Applied Cryptography

Objectives:

1. To Introduce the concept of system threats, vulnerability, attacks and controls.
2. To Provide Knowledge about program security.
3. To learn significance of Operating and database security.
4. To gain detailed understanding about Network & web attacks as well as their mitigation.

Outcomes: On completion of the course, learner will be able to:

1. Understand the system security goals and concepts.
2. Learn programming oversight as well as various types of malicious code along with their mitigation techniques.
3. Articulate the need of operating system security.
4. Analyze different attacks on networks and apply preventive measures on them.
5. Identify contemporary practices of web security against web attack.
6. Demonstrate understanding of security requirements and access controls of Database.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction** Threats, vulnerabilities, and controls, Attackers and attack types, method, opportunity, and motive , Valuing assets	**4**
2	**Program Security** Programming oversights: buffer overflows, off-by-one errors, incomplete mediation, time-of-check to time-of-use errors , Malicious code: viruses, worms, Trojan horses, Developer countermeasures: program development techniques, security principles, Ineffective countermeasures	**6**

Unit	Description	Duration
3	**Operating System Security** Object protection: virtualization, sharing , Memory protection: registers, paging, segmentation , Design qualities: modularity, layering, kernelization ,Trusted systems: TCB, reference monitor, trusted path, object reuse, evaluation criteria , Rootkits: power, design , CASE Study on Windows Security.	7
4	**Network Security** Vulnerabilities • Threats in networks: wiretapping, modification, addressing • Wireless networks: interception, association, WEP, WPA • Denial of service and distributed denial of service Protections • Cryptography for networks: SSL, IPsec, virtual private networks • Firewalls • Intrusion detection and protection systems • Managing network security, security information, and event management	8
5	**Web Security** Attacks against browsers, Types of Browsers attack , How Browser Attacks Succeed: Failed Identification and Authentication, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.	7
6	**Database Security** Database terms and concepts , security requirements: C-I–A; reliability, types of integrity , access control; sensitive data, disclosure, inference, aggregation ,data mining and big data	7
	Total	39

List of Laboratory Experiments: (Minimum any eight experiments)	
Sr. No.	**Suggested Experiments**
1	Implement the Dictionary attack on password.
2	Implement secured techniques to exchange password over communication channel.
3	Implement Biometric authentication Techniques.
4	Implementation Buffer overflow attack.
5	Implementation SQL Injection attack.
6	Implementation page in the middle attack.
7	Implementation cross site scripting attack.
8	Implementation a technique to detect fake email.
9	Implementation a IDS techniques.
10	Implement / Demonstrate DoS attack.
11	Discussion of Research Paper / Journal on Network Security .
12	Case Study on Big Data security.
13	Case Study /Seminar: Program Malware Detection.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text Books:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies – Security in Computing ,5th Edition, Prentice Hall, 2015
2. William Stallings, Cryptography and Network Security, Principles and Practice, 6th Edition, Pearson Education, March 2013.
3. Behrouz A. Ferouzan, ―Cryptography & Network Security‖, Tata McGraw Hill, March 2007.
4. Bernard Menezes, ―Cryptography & Network Security‖, Cengage Learning, April 2010.
5. Network Security Bible, Eric Cole, Second Edition, Wiley, September 2009.

Reference Books:

1. Cryptography and Network Security, Atul Kahate, Tata Mc Graw Hill, 2017.

Web resources:

1. Web Security : https://developer.mozilla.org/en-US/docs/Learn/Server-side/First_steps/Website_security

2. Web Application Security : https://www.cloudflare.com/learning/security/what-is-web-application-security/

3. CCIE Professional Development Network Security , Principal and Practics.

4. Database security - concepts, approaches, and challenges : https://ieeexplore.ieee.org/abstract/document/1416861

Online Courses: NPTEL / Swayam

1. https://archive.nptel.ac.in/courses/106/106/106106129/
2. https://nptel.ac.in/courses/128106006
3. https://www.coursera.org/specializations/introduction-applied-cryptography

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 75 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Laboratory

Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal documentation (Write-up and/or Assignments): 5 marks
iii. Attendance (Theory + Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech.** **Semester: VI**

Course: Cryptocurrency Technology (DJ19ICC602)

Course: Cryptocurrency Technology Laboratory (DJ19ICL602)

Prerequisite:

1. Applied Cryptography
2. Blockchain Technology

Objectives:

1. To introduce the main concepts related to blockchain and cryptocurrencies
2. To provide skills and knowledge about operations and management in cryptocurrency technologies.
3. To decide suitable model to capture the business needs by analyzing different cryptocurrencies.
4. To design cryptocurrencies that meets the business service and customer needs

Outcomes: On completion of the course, learner will be able to:

1. Understand evolution, principles and benefits of Cryptocurrencies.
2. Infer the various bitcoin related security and privacy issues.
3. Analyze the real-world cryptocurrency ecosystem.
4. Develop and deploy auction-based smart contracts on the Ethereum blockchain
5. Design cryptocurrency with appropriate policies and mechanisms
6. Explore applications beyond traditional cryptocurrencies.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Cryptocurrency** **Preview:** The need of Cryptocurrency evolution Digital currency, cryptocurrency vs flat currency, A Simple Cryptocurrency: GoofyCoin, ScroogeCoin, Usage of Cryptocurencies **Cryptocurrency Regulation:** Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy **Decentralized Mixing & cryptocurrency anonymity**: Coinjoin, Zerocoin and Zerocash, A comparison of the anonymity technologies	**10**

Unit	Description	Duration
2	**Cryprocurrencies and Bitcoin** Introduction to Cryptocurrencies Tokens – Cryptosecurities, Players involved - Cryptocurrency Users, Miners, Cryptocurrency exchanges, Trading platforms, Wallet providers, Coin inventors, Coin offerors. Building Bitcoin payment system, Building payment gateway, cloning bitcoin, Readercoin rebranding	7
3	**Altcoins and the Cryptocurrency Ecosystem** Altcoins: History and Motivation, Altcoin Blockchain, Altcoin Types: Namecoin, Litecoin, Peercoin, Dogecoin, Relationship Between Bitcoin and Altcoins, Merge Mining and Security, Atomic Cross-chain Swap protocol, Bitcoin-Backed Altcoins: "Side Chains"	6
4	**Cryptocurrency and Auctions in Ethereum** Ether(ETH) as a cryptocurrency, Overview of auction mechanisms, Auctions in Ethereum:, Building an auction DApp: Auction description, Dutch and Vickrey auctions in Solidity, Deployment and testing of auction smart contracts on the Ethereum testnet	6
5	**Building Cryptocurrency** E-governance and other contract enforcement mechanisms, Initial Coin Offerings (ICOs) in Cryptocurrency, Definition and Purpose of ICOs, ICO vs. Traditional Fundraising **Key Components of ICOs**: Tokenomics- Designing Tokens for ICOs, ICO Smart Contracts and Crowdsale Mechanisms, Structure and Content Risks and Challenges Associated with ICOs Assessment	6
6	**Beyond Cryptocurrency** Smart property, Efficient micro-payments, Coupling transactions and payments, Escrow transactions, Green addresses, Multi-party Lotteries, Digital Rupee -eINR or E-Rupee, UPI - Unified Payments Interface	4
	Total	39

List of Laboratory Experiments: (Minimum any eight experiments)	
Sr. No.	**Suggested Experiments**
1	To perform case study of Cryptocurrency Market Dynamics
2	To create and build Crypto Tokens
3	To find the exchange rate for bitcoin with the help of necessary data and find the number of bitcoins by applying the equation over the defined values
4	To calculate the 'number of ethers' for the transaction of gas limit for the scenario in which the sender sets the gas limit to 50,000 and a gas price to 20 gwei.
5	To represent the Ethereum Merkley Tree for the given list of Transactions
6	To implement Dutch and Vickrey auctions in Solidity

7	To deploy and test of auction smart contracts on the Ethereum TestNet
8	To generate public and private key pairs using cryptographic libraries and Simulate the signing and verification of transactions
9	To perform transactions using privacy-focused cryptocurrencies (e.g., Monero).
10	To explore coin mixing services to enhance transaction privacy.
11	To study Pre-designed smart contract templates for creating custom tokens and managing ICO-related functionalities.
11	To generate a simulated cryptocurrency token to use during the ICO
12	To Analyze real-world use cases of blockchain and cryptocurrencies
13	To Perform Case studies of successful ICOs

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Antonopoulos, Andreas M. (2014). Mastering Bitcoin: Unlocking Digital Crypto-Currencies. O'Reilly Media, Inc, ISBN:978-1-4493-7404-4
3. Makoto Yano, Chris Dai, Kenichi Masuda, Yoshio Kishimoto , "Blockchain and Crypto Currency: Building a High Quality Marketplace for Crypto Data",Springer; 1st ed. 2020 edition (April 16, 2020)
4. Mastering Block chain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017 Reference Books
5. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, -Blockchain Technology: Cryptocurrency and Applications, Oxford University Press, 2019

Reference Books:

1. Fantazzini, D. Quantitative Finance with R and Cryptocurrencies. Amazon KDP, ISBN-13 978-1090685315,2019:. https://sites.google.com/view/quafirc
2. Daskalakis, Nikos, and Panagiotis Georgitseas, "An Introduction to cryptocurrencies: The Crypto Market Ecosystem", Routledge, 1st Edition, 2020
3. Grabowski, Mark, "Cryptocurrencies: A Primer on Digital Money", Routledge, 1st Edition, 2019

4. Quinn Dupont, " Cryptocurrencies and Blockchain", Willey, 2019, ISBN: 978-1-509-52023-7

Web resources:

1. Crycptocurrency and Bitcoin: https://intelligenttrading.org/guides/cryptoasset-classifications/
   https://www.investopedia.com/tech/most-important-cryptocurrencies-other-than-bitcoin/
2. How to Create Your Own Cryptocurrency – https://coinmarketcap.com/academy/article/how-to-create-your-own-cryptocurrency
3. Cryptocurrency- https://www.investopedia.com/tech/most-important-cryptocurrencies-other-than-bitcoin/
4. Cryptocurrency & Blockchain Technology
   https://guides.loc.gov/fintech/21st-century/cryptocurrency-blockchain
   https://guides.loc.gov/fintech/21st-century/cryptocurrency-blockchain

Online Courses: NPTEL / Swayam/MOOC

1. Blockchain and its Applications, By Prof. Sandip Chakraborty, Prof. Shamik Sural IIT Kharagpur
   https://onlinecourses.nptel.ac.in/noc23_cs47/preview
2. https://www.coursera.org/specializations/introduction-to-blockchain
3. https://www.coursera.org/learn/wharton-cryptocurrency-blockchain-introduction-digital-currency
4. https://www.velmie.com/practical-blockchain-study
5. Udemy- The Complete Cryptocurrency Course: More than 5 Courses in 1
   https://www.udemy.com/course/the-complete-cryptocurrency-course-

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Laboratory

Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.

2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Laboratory work will be based on **DJ19ICL602** with a minimum of 08 experiments
The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal documentation (Write-up and/or Assignments): 5 marks
iii. Attendance (Theory + Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology

T.Y. B.Tech.

Semester: VI

Course: Machine Learning (DJ19ICEC6011)

Course: Machine Learning Laboratory (DJ19ICEL6011)

Pre-requisite:

1. Artificial Intelligence
2. Statistics for Engineers
3. Python Programming

Objectives:

1. To understand basic concepts of Machine Learning.
2. To explore different machine learning methods.
3. To familiarize with regression, clustering, classification.
4. To evaluate SVM models effectively using metrics like accuracy, precision, recall, and F1-score

Outcomes: On completion of the course, learners will be able to:

1. Understand the types of machine learning
2. Apply regression analysis to real-world problems and datasets
3. Construct decision trees using different algorithms.
4. Make optimal decisions based on Bayesian principles.
5. Identify patterns in data and classify or cluster information into distinct categories.
6. Analyze different SVM techniques.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Machine Learning:** Terminologies in machine learning, Types: supervised, unsupervised, semi-supervised learning, Issues in Machine Learning, Application of Machine Learning, Steps involved in developing a Machine Learning Application, Hypothesis, and Inductive Bias, Need of Dimensionality Reduction Techniques. Feature extraction and selection methods.	**6**
2	**Regression:** Linear Regression, Least Square Regression, Gradient Descent Algorithm, Univariate and Multivariate Linear Regression, Prediction Model, probabilistic interpretation, Regularization, Logistic regression, multi class classification, Principal components analysis, Linear Discriminant Analysis.	**7**
3	**Decision Tree:** Definitions, Supervised Learning of Univariate Decision Tree, Attribute Selection Measures, Multiway Splits and binary splits, Regression Trees (CART), Overfitting and Evaluation, Stopping Criterion & Pruning loss functions, Model Evaluation and Selection	**7**
4	**Bayes Decision Theory**: Bayes decision rule, Minimum error rate classification, Normal density, and discriminant functions. Naïve Bayes algorithm, Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation Ensemble Models: Introduction to Ensemble Methods, Bagging, Boosting, Random forests, Improving classification accuracy of Class-Imbalanced Data.	**7**
5	**Clustering:** Partitional Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering, Radial Basis functions, Gaussian mixture model.	**6**
6	**Support Vector Machine:** Linear learning machines and Kernel space, Making Kernels and working in feature space SVM for classification and regression problems. Evaluation Measures: Bootstrapping & Cross Validation, Class Evaluation Measures, The ROC Curve Minimum Description Length & Exploratory Analysis. 04	**6**
	Total	**39**

List of Laboratory Experiments: (Minimum any eight using Python)	
Sr. No.	**Suggested Experiments**
1	Perform Linear Regression.
2	Perform Logistic Regression.
3	Perform Multivariate Linear Regression
4	Implement program to detect outlier anomalies in data

5	To implement CART decision tree algorithm.
6	Perform Ensemble methods.
7	To implement Random forest algorithm.
8	Implement Birch Algorithm
9	Perform Bayesian Classification.
10	Perform Support Vector Machine
11	Perform K-means clustering
12	Analyze performance measures.
13	Mini project based on any machine learning application.
14	Any other experiment may be included, which would help the learner to understand the topic/concept.

Books Recommended:

Text Books

1. Tom M.Mitchell, "Machine Learning", 1 st edition, McGraw Hill Education, 2017.

2. Peter Harrington, "Machine Learning in Action", 1 st Edition, DreamTec Press, 2012.

3. Ethem Alpaydın, "Introduction to Machine Learning", 3rd Edition, MIT Press, 2014.

4. Kevin P Murphy, "Machine Learning a probabilistic perspective", Illustrated edition, The MIT Press, 2012.

Reference Books

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 2nd Edition, The MIT Press, 2012.

2. Andreas C. Müller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1 st Edition, O'reilly, 2016.

3. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", 2 nd Edition, CRC Press, 2014.

4. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", 3 rd Edition Morgann Kaufmann Publishers, 2011.

Web Resources:

1. Tensorflow: https://www.tensorflow.org/

2. Pytorch: https://pytorch.org/

3. Scikit-learn: https://scikit-learn.org/stable/

Online Courses: NPTEL / Swayam/MOOC

1. "NPTEL course on Introduction to Machine Learning by Prof. Balaraman Ravindran", https://nptel.ac.in/courses/106106139
2. "NPTEL course on Machine Learning by Prof. Carl Gustaf Jansson, Prof. Henrik Bostrom, Prof. Fredrik Kilander", https://nptel.ac.in/courses/106106202
3. "NPTEL course on Introduction to Machine Learning by By Prof. Sudeshna Sarkar", https://onlinecourses.nptel.ac.in/noc22_cs97/preview
4. "Coursera course on Supervised Machine Learning", https://www.coursera.org/learn/machine-learning

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Laboratory
Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of the marks scored in the both the tests will be considered for final grading.

Laboratory: (Term work)

Laboratory work will be based on **DJ19ICEL6011** with a minimum of 08 experiments and mini projects. The distribution of marks for term work shall be as follows:

1. Laboratory work, Assignment (Performance of Experiments, Write Up): 15 Marks

2. Mini Project: 05 Marks

3. Attendance (Theory + Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech.** **Semester: VI**

Course: Mobile Security and Forensics (DJ19ICEC6012)

Course: Mobile Security and Forensics Laboratory (DJ19ICEL6012)

Prerequisite:

1. Network Fundamentals
2. Operating Systems

Objectives:

1. To understand mobile device hardware and software characteristics.
2. Identify various risks and attacks on mobile devices.
3. To comprehend the concept of mobile device management framework.
4. To explore the need for mobile forensics and its practices.

Outcomes: On completion of the course, learner will be able to:

1. Describe mobile device architecture and its software characteristics.
2. Analyze various risks and attacks on mobile devices.
3. Acquire fundamental concept of mobile device management framework.
4. Usage of mobile forensics and its practices.
5. Express the functionalities of Mobile OS forensics.
6. Compare and analyze mobile data carving methods.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Introduction to Mobile Devices**: Basics of Mobile phone & communications: Components of Cellular Network, Different Mobile Devices, Hardware & Software Characteristics of Mobile Devices, **Mobile Operating Systems:** Classification of Mobile Operating Systems (Android OS, Apple iOS), difference between desktop operating system and mobile operating system. Top Issues Facing Mobile Devices.	6
2	**The Mobile Risk Ecosystem** **Mobile Risk Model:** Physical Risks, Service Risks and App Risks, **Basic Cellular Network Functionality**: Interoperability, Voice Calls, The Control Channels, Voice Mailboxes, Short Message Service, **Attacks and Countermeasures:** Hacking Mobile Voicemail, Countermeasures for Mobile Voicemail Hacks, Rogue Mobile Devices, Rogue Mobile Device Countermeasures, Early Rogue Station Attacks, Rogue Base Station Countermeasures, Rogue Femtocell Attacks, Countermeasures for Rogue Femtocells.	7

3	**Mobile Device Management** MDM Frameworks, Device Provisioning, Bypassing MDM, Decompiling and Debugging Apps, Detecting Jailbreaks, Remote Wipe and Lock. **Mobile App Threat Modelling:** Threats, Assets, Finishing and Using the Threat Model. **Secure Mobile Development Guidance:** Preparation, Secure Mobile Application Guidelines.	**6**
4	**Introduction to Mobile Forensics (Practical Mobile forensics)** Need for mobile forensics, Mobile forensics, Challenges in mobile forensics, the evidence intake phase, the identification phase, preparation phase, isolation phase, processing phase, verification phase, documenting and reporting phase, the presentation phase, archiving phase, Data acquisition methods, Examination and analysis, **Good forensic practices:** Securing the evidence, Preserving the evidence, Documenting the evidence and changes, Reporting.	**7**
5	**Introduction to iOS Forensics (Practical forensic analysis)** iOS Boot Process, iOS Architecture, iOS Architecture Layers, The HFS Plus and APFS File Systems, iOS Security, iOS Data Extraction Techniques, Data Acquisition from Backup Devices, Data Acquisition from iOS Devices, Jailbreaking. **Introduction to Android Forensics:** Android File System, Flash Memory File Systems, Media-Based File Systems, Pseudo File Systems, Android System Architecture, Android System Permission Model, Data Extraction Techniques on Android, Mobile Forensics Investigation Challenges on Android Devices	**7**
6	**Data carving:** best practices – ACPO, Interpol, STCIA, DOJ guidelines and best practices in Indian environment. Responsive toolkit – preparation, portable software tools, validation of tools, things to carry. Areas to search – Active files, deleted files, slack space, unallocated space, hibernation file, page file, metadata and registry etc. Case Study for crime scene investigation.	**6**
	Total	**39**

List of Laboratory Experiments: (Minimum any eight experiments)	
Sr. No.	**Suggested Experiments**
1	To install Android SDK
2	To Study and install Androguard to analyse apk files.
3	To Study and install Drozer in kali Linux and Drozer agent in android device.
4	To Study and install mobsf installation in windows for mobile pen-testing, malware analysis and security assessment.
5	To Study and install QARK (Quick Android Review Kit) tool capable of finding common security vulnerabilities in Android.
6	To Study and install Frida (Dynamic Instrumentation Toolkit) to modify code snippets of JavaScript.
7	To Study GDA (GJoy Dex Analyzer) - Android Reversing Tool

8	To perform Screen lock bypassing in Android
9	To perform SQLite Browser to view the data in Android
10	To perform recovery of deleted data and files from an external SD card using file-carving techniques.
11	To perform analysis of Android apps using Android Lint.
12	To perform extraction of an APK file from an Android device.
13	To perform Mobile forensics using UFED tool.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text Books:

1. Kumar Saurabh , Ashutosh Saxena, Mobile Forensics Investigation , 3nd Edition, TMH, 2020, ISBN: 978-1-26-013510-7
2. Rohit Tamma, Oleg Skulkin, Heather Mahalik, Satish Bommisetty, Practical Mobile Forensics 4th Edition, Packt Publishing, 2020
3. Mobile Device Security by Stefen Fried, CRC Press 2017.
4. Himanshu Dwivedi, Chris Clark, David Thiel, Mobile Application Security 3rd Edition, TMH Publishing, 2010, ISBN: 978-0-07-163357-4,

Reference Books:

1. Practical Mobile Forensics, Mohammed Moreb, 2022, Apress
2. Wireless and Mobile Device Security Jim Doherty, JONES & BARTLETT learning 2nd edition 2021.
3. Mobile Application hackers handbook , Dominic Chell,Tyrone Erasmus, Wiley 2nd edition 2017.
4. Hacking Exposed mobile Security and Solutions Neil Bergman,Mike Stanfield, Jason Rouse McGraw Hill Publishing 1st edition 2017.

Web resources:

1. Android Hacking tools -Top 10 Github Hacking Tools for Android (analyticsinsight.net).
2. MOOCS resources - Introduction to Forensic Science https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/3.
3. https://www.udemy.com/course/mobile-application-security-and-penetration-testing-e/.
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/ethical-hacking-mobile-platforms-and-network-architecture.

Online Courses: NPTEL / Swayam

1. Digital Forensic, By Dr. Navjot Kaur Kanwal
   https://onlinecourses.swayam2.ac.in/cec20_lb06
2. https://www.ifsedu.in/cell-phone-forensics/
3. https://www.udemy.com/course/mobile-computer-forensics/
4. https://www.iacis.com/training/online-mdf-mobile-device-forensics/

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory

Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Laboratory work will be based on **DJ19ICEL6012** with a minimum of 08 experiments

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal documentation (Write-up and/or Assignments): 5 marks
iii. Attendance (Theory + Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech. Semester : VI**

Course: IoT Architecture and Protocols (DJ19ICEC6013)

Course: IoT Architecture and Protocols Laboratory (DJ19ICEL6013)

Prerequisite:

1. Network Fundamentals
2. Operating Systems

Objectives:

1 To understand IoT Characteristics and Conceptual Framework.
2 To comprehend network architecture and design of IoT
3 To be aware of smart objects in IoT.
4 To correlate the connection of smart objects and IoT access technologies.

Outcomes: On completion of the course, learner will be able to:

1. Describe the IoT Characteristics and Conceptual Framework.
2. Differentiate between the levels of the IoT architectures.
3. Interpret sensor network and its components.
4. Analyze the IoT access technologies.
5. Illustrate various protocols at network layer and application layer for IoT.
6. Analyze and evaluate security issues in IoT and risk analysis structure.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to IoT** Introduction to IoT- Defining , Characteristics , Conceptual Framework of , Physical design, Logical design , Functional blocks, Communication models & APIs, Basics of networking Communication protocol, wireless sensor networks. Convergence of IT and OT (Operational Technology), IoT Challenges, IoT protocol vs Web Protocol stack	**6**
2	**IoT Network Architecture and Design** Drivers Behind New Network Architectures : Scale,Security,Constrained Devices and Networks ,Data,Legacy Device Support , Architecture : The IoT World Forum (IoTWF) Standardized Architecture :Layer 1-7, IT and OT	**8**

	Responsibilities in the IoT Reference Model, Additional IoT Reference Models, A Simplified IoT Architecture, The Core IoT Functional Stack ::Layer 1-3 , Smart Services and IoT Data Management.	
3	**Smart Objects IoT:** Sensors, Actuators, and Smart Objects, Attributes of Sensors, Actuators, Micro-Electro-Mechanical Systems (MEMS) Smart Objects: A Definition, Trends in Smart Objects, Sensor Networks, Wireless Sensor Networks (WSNs), Communication Protocols for WSN, RFID and NFC.	**5**
4	**Connecting Smart Objects** Communications Criteria: Range, Frequency Bands, Power Consumption, Topology, Constrained Devices, Constrained-Node Networks, Data Rate and Throughput, Latency and Determinism, Overhead and Payload. IoT Access Technologies : Standardization and Alliances , Physical Layer , MAC Layer , Topology ,Security and Conclusion of IEEE 802.15.4 , IEEE 802.15.4g and 802.15.4e ,IEEE 1901.2a ,IEEE 802.11ah , LoRaWAN, and NB-IoT and Other LTE Variations , LTE Cat 0 , LTE-M, NB-IoT.	**6**
5	**IoT Network Layer and Application protocols** RPL, Objective Function Rank, RPL Headers, Metrics , Authentication and Encryption on Constrained Nodes, ACE, DICE, Profiles and Compliances, Internet Protocol for Smart Objects Alliance, Wi-SUN Alliance, Thread, IPv6 Ready Logo. Transport Layer, IoT Application Transport Methods, Generic Web-Based Protocols.	**7**
6	**Securing IoT** A Brief History of OT, **Security Common Challenges in OT Security** : Erosion of Network Architecture, Pervasive Legacy Systems, Insecure Operational Protocols , Device Insecurity **Security Knowledge:** IT and OT Security Practices and Systems Vary, The Purdue Model for Control Hierarchy, OT Network Characteristics Impacting Security. **Security Priorities:** CIA, Security Focus Formal Risk Analysis Structures: OCTAVE and FAIR, FAIR. The Phased Application of Security in an Operational Environment, Secured Network Infrastructure and Assets, Deploying Dedicated Security Appliances, Higher-Order Policy Convergence and Network Monitoring.	**7**
	Total	**39**

List of experiments

Sr. No	**List of Laboratory Experiments: (Minimum any eight experiments)**
1	To study and implement interfacing of different IoT sensors with Raspberry Pi pico/Arduino/ModeMCU.
2	To study and implement interfacing of actuators based on the data collected using IoT sensors. (like led switch ON/OFF, stepper motor)
3	To study and demonstrate Contiki OS for RPL (like Create 2 border router and 10 REST clients, Access border router from other network (Simulator))
4	To study and demonstrate working of 6LoWPAN in Contiki OS (simulator)
5	Write a program on Raspberry Pi to push and retrieve the data from cloud like thingspeak/thingsboard/AWS/ Azure etc

6	To study and implement IoT Data processing using Pandas on raspberry pi.
7	Write a program on Arduino / Raspberry Pi subscribe to MQTT broker for temperature data and print it.
8	Write a program to create TCP Server on Arduino/Raspberry Pi and respond with humidity data to TCP client when Requested.
9	Write a program for ESP8266 DHT11/DHT22 Temperature and Humidity Web Server with Arduino IDE.
10	Write an application using Raspberry Pi/Arduino for streetlight control system. System consists of smart street lights that have external light sensing that automatically turns on at desired intensity based on amount of lighting needed.
11	Write an application using Raspberry Pi/Arduino for smart health monitoring system which records heart beat rate and temperature and also sends sms alerts if readings are beyond critical values.
12	Write a program to implement smart home automation system. The system automates home appliances and control them over internet from anywhere.

Books Recommended:

Text Books:

1. Arsheep Bahga (Author), Vijay Madisetti, Internet Of Things: A Hands-On Approach Paperback, Universities Press, Reprint 2020
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, IoT Fundamentals Networking Technologies, Protocols, and Use Cases for the Internet of Things CISCO. 2020.

Reference Books:

1. Pethuru Raj, Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases by, CRC Press.

2. Raj Kamal, Internet of Things, Architecture and Design Principles, McGraw Hill Education, Reprint 2018.

3. Perry Lea, Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, Packt Publications, Reprint 2018.

4. Amita Kapoor, “Hands on Artificial intelligence for IoT”, 1st Edition, Packt Publishing, 2019. Sheng-Lung Peng, Sou

Web resources:

1. https://owasp.org/www-project-internet-of-things/
2. https://www.edx.org/learn/computer-architecture/waseda-university-iot-system-architecture-design-and-evaluation.
3. https://www.coursera.org/learn/iot-architecture.
4. https://www.classcentral.com/course/iot-software-architecture-6507.

Online Courses: NPTEL / Swayam:

1. NPTEL: Sudip Misra, IIT Khargpur, Introduction to IoT: Part-1, https://nptel.ac.in/courses/106/105/106105166/
2. NPTEL: Prof. Prabhakar, IISc Bangalore, Design for Internet of Things, https://onlinecourses.nptel.ac.in/noc21_ee85/preview

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory

Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory work will be based on **DJ19ICEL6013** with a minimum of 08 experiments

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal documentation (Write-up and/or Assignments): 5 marks
iii. Attendance (Theory + Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology | **T.Y. B.Tech.** | **Semester : VI**

Course: Universal Human Values (DJ19IHC1)

Course: Universal Human Values Tutorial (DJ19IHT1)

Objectives:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society, and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society, and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

Outcomes: On completion of the course, learner will be able to:

1. Become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability.

2. Become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).

3. Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	Introduction: Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels	**05**

Unit	Description	Duration
2	Understanding Harmony in the Human Being-Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I am being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.	**06**
3	Understanding Harmony in the Family and Society: Harmony in Human-Human Relationship. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	**06**
4	Understanding Harmony in the Nature and Existence: Whole existence as Coexistence Understanding the harmony in the Nature 19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**05**
5	Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values 23. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order, b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to	**06**

	Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists, and managers, b. At the level of society: as mutually enriching institutions and organizations.	
	Total	**39**

Books Recommended:

Textbooks:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Evaluation:

Semester End Examination (A):

Theory:

1) Question paper will be based on the entire syllabus summing up to 75 marks.

2) Total duration allotted for writing the paper is 3 hrs. Continuous Assessment

(B): Theory:

1) Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.

2) Total duration allotted for writing each of the paper is 1 hr.

3) Average of the marks scored in both the two tests will be considered for final grading.

Continuous Assessment (C):

Tutorials: (Term work)

1. Term work shall consist of minimum 4activities based on activities suggested.
2. Term work shall carry total 25 marks based on the performance in the tutorials.

The tutorials could be conducted as per the following topics: -

Activity No 1	Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony, and coexistence) rather than as arbitrariness in choice based on liking-disliking.
Activity No 2	Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.
Activity No 3	Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.
Activity No 4	Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
Activity No 5	Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

The final certification and acceptance of term work will be subject to satisfactory performance of activities and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech. Semester : VI**

Course: Professional and Business Communication Laboratory (DJ19IHL2)

Pre-requisite:
Basic course in Effective Communication Skills

Objectives:

1. To inculcate professional and ethical attitude at the workplace
2. To enhance communication and interpersonal skills
3. To develop effective employability skills
4. To hone written skills for technical documentation

Outcomes: On completion of the course, learner will be able to:

1. Prepare technical documents using appropriate style, format, and language
2. Use employability skills to optimize career opportunities
3. Employ storytelling techniques in corporate situations
4. Conduct effective meetings and document the process
5. Demonstrate interpersonal skills in professional and personal situations
6. Describe cultural differences, etiquettes, and the concept of professional ethics

Detailed Syllabus: (unit wise)		
	Description	**Duration**
	Unit 1: Technical Writing	
	Report Writing: Types of reports, Basic structure of a report, collection of datathrough questionnaires, survey analysis, language and style in reports **Business Proposal Writing:** Types of business proposals, format of proposal,language and style, presentation of proposal **Plagiarism:** Types of plagiarism, consequences of plagiarism	**06**
	Unit 2: Employment Skills	
	Group Discussion: Purpose of a GD, types of GD, criteria for evaluating GD,Dos and Don'ts of GD **Resume Writing:** Types of resumes, structure, content and formatting of resume **Interview Skills:** Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview **Presentation Skills:** Presentation strategies, overcoming stage fear, techniques toprepare effective PowerPoint presentation	**08**

	Unit 3: Corporate Story Telling	**03**
	Basics of storytelling: Setting, characters, plot, crisis, climax, resolution,Benefits of storytelling **Types of stories:** Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOP's and interviews, storytelling to manageconflict or to motivate **Storytelling techniques:** Narration using verbal and non-verbal communication,Analysis of storytelling strategies of corporate master storytellers	
	Unit 4: Meetings and Documentation	
	Planning and preparation for meetings: Planning layout of meetings, arranginglogistics, defining roles and responsibilities **Strategies for conducting effective meetings:** Follow the agenda**,** recorddiscussion, observe meeting decorum **Documentation:** Draft notice, agenda and minutes of meeting **Business meeting etiquettes: V**erbal and non-verbal aspects of etiquettes	**02**
	Unit 5: Introduction to Interpersonal Skills	
	Emotional Intelligence: Definition, difference between IQ and EQ, how todevelop EQ **Leadership:** Types of leadership, leadership styles, case studies **Team Building:** Difference between group and team, importance of teamwork,strategies to be a good team player **Time Management:** Importance of time management, cultural views of time,80/20 rule, time wasters, setting priorities and goals, **Conflict Management:** Types of conflicts, strategies to manage conflict, casestudies	**05**
	Unit 6: Cross-cultural communication and Professional ethics	
	Communication across cultures: Understanding cultures and developing sensitivity towards cultural differences **Corporate etiquettes**: Telephone, dining, cubicle etiquette, etc. **Professional ethics:** Effective work habits, accountability, integrity and excellence	**02**
	Total	**26**

Professional and Business Communication Laboratory

Laboratory (conducted batch wise) will comprise of activities and assignments based on the syllabus)

Books Recommended:

1. Fred Luthans, *"Organizational Behavior",* McGraw Hill, edition
2. Lesiker and Petit, *"Report Writing for Business",* McGraw Hill, edition
3. Huckin and Olsen, *"Technical Writing and Professional Communication",* McGraw Hill
4. Wallace and Masters, *"Personal Development for Life and Work",* Thomson Learning, 12th edition
5. Heta Murphy, *"Effective Business Communication",* Mc Graw Hill, edition
6. Sharma R.C. and Krishna Mohan, *"Business Correspondence and Report Writing",* Tata McGraw-Hill Education
7. Ghosh, B. N., *"Managing Soft Skills for Personality Development",* Tata McGraw Hill. Lehman,

8. Bell, Smith, “Management Communication” Wiley India Edition, 3rd edition.
9. Dr. Alex, K.,” Soft Skills”, S Chand and Company
10. Subramaniam, R., “Professional Ethics” Oxford University Press.
11. Sandeep Das, “How Business Story Telling Works: Increase Your Influence and Impact” PenguinRandom House India Pvt. Ltd.

Evaluation Scheme:
Laboratory: (Term work)

Term work shall consist of 6 assignments, Group Discussion and Power Point Presentation based onthe Business Proposal.
The distribution of marks for term work shall be as follows:
Tutorials..... (25) Marks
Business Proposal ..... (15) Marks
Group Discussion.....(10) Marks
TOTAL.....(50) Marks

The final certification and acceptance of term work will be subject to satisfactory performance oflaboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech. Semester : VI**

Course: Skill Based Course Laboratory (UI/UX Lab) (DJ19ICL603)

Prerequisite: Knowledge of Web Programming.

Objectives:

1. Explore various user research methods and information architecture and to use them in interaction design, visual design and functional Layout Design.
2. Introduces students to usability testing which is performed on various design.

Outcomes: On completion of the course, learner will be able to:

1. Identify user requirements.
2. Design UI/UX using appropriate methods.
3. Generate test report using usability testing.
4. Work effectively as a member of the team.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction :** Introduction to interface design, Understanding and conceptualizing Interface, Understanding user's conceptual cognition., The 5 Main Ingredients of UX: Psychology, Usability, Design, Copywriting & Analysis. Seven factors that influence user experience-useful, usable, findable, credible, desirable, accessible, valuable	**4**
2	**User Research:** UX research, Difference between good and bad UX research, Five steps of UX research, Role of research in the UX design process, Value of UX research, Seven Great, Tried and Tested UX Research Techniques: Card sorting, Expert review, Eye movement tracking, Field studies, Usability testing, Remote Usability Testing, User Personas. Defining the UX, Design Process and Methodology, understanding user requirements and goals, Understanding the Business Requirements/Goals, User research, mental models, wireframes, prototyping, usability testing. **Other Research Methods:** User Interviews, Observation, Focus group discussion, Survey Competitor analysis, Empathy mapping	**6**

3	**Interaction Design:** Ideation Methods – Interaction, Wireframing and Prototyping, Paper Prototyping, Build your own Prototyping, Prototyping Tools For UI/UX Designers, Heuristic (Expert) Evaluation, Designing a Web / Mobile	**5**
4	**Visual Design:** Web App UI Elements, Mobile App UI Elements, Grid Systems, Colors Theoryand Palette, Understanding Typography – Material UI.	**4**
5	**Functional Layout Design:** Z-Pattern, F-Pattern, and Visual Hierarchy, Browsing vs. Searchingvs. Discovery, Page Framework, The Fold, Images, & Headlines, The Axis of Interaction Forms, Calls-to-Action, Instructions & Labels, Primary & Secondary Buttons.	**5**
6	**Usability Testing:** Testing Methods - User Testing - A/B Testing - Conducting a Usability Test -Test Results Report	**4**
	Total	**28**

List of Laboratory Experiments: (Task for Miniproject)	
Sr. No.	**Suggested Experiments**
1	**Interaction Design** Create the design via paper prototyping Apps Build the own prototyping with Adobe XD Designing the own Web / Mobile App
2	**Visual Design:** Create and design the UI Elements Implement all UI Elements in the Web App / Mobile App Understand the Grid System and implement the Web App / Mobile App Implement colors Theory and Typography in your own Web App/ Mobile App Through Material UI and other UI Kit
3	**User Research**: Post personas with your image and collective information Create the own idea with Empathy Mapping
4	**Usability Testing:** Conduct a user testing and Usability testing Submit the Test result report
5	Presentation on selected mini project topic

Books Recommended:

Text books:

1. Donald Norman, “The Design of Everyday Things: Revised and Expanded Edition”, Basic Books, 2013.

2. Rogers Sharp Peerce," Interaction Design: Beyond Human Computer Interaction", 5th Edition, Wiley, 2019.

Reference Books:

1. Jeff Johnson, "Designing with the mind in mind", 2nd Edition, Morgan Kaufmann Publication, 2014.
2. Alan Dix, Janet Finlay, Gregory Abowd, Russel Beale, "Human–Computer Interaction", Pearson, 2009.
3. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009.
4. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication, 2002.

Web Recourses:

1. https://thehipperelement.com/post/75476711614/ux-crash-course-31-fundamentals
2. https://uiuxtrend.com/user-experience-ux-process/
3. Introduction:
   https://careerfoundry.com/en/blog/ux-design/how-to-create-your-first-wireframe/
   a. https://uxplanet.org/what-is-ui-vs-ux-design-and-the-difference-d9113f6612de
   b. https://uxplanet.org/a-complete-list-of-ux-deliverables-d62ccf1de434
   c. https://www.toptal.com/designers/ux/10-common-ux-deliverables
   d. https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular
   e. https://thehipperelement.com/post/72080847673/daily-ux-crash-course-3-of-31
4. User research:
   a. https://careerfoundry.com/en/blog/ux-design/how-to-conduct-user-experience-research-like-a-professional/
   b. https://www.interaction-design.org/literature/article/7-great-tried-and-tested-ux-research-techniques
5. Visual Design
   a. https://www.awwwards.com/understanding-web-ui-elements-principles.html
   b. https://blog.tubikstudio.com/mobile-ui-design-15-basic-types-of-screens/
   c. https://appsamurai.com/6-necessary-elements-for-designing-a-perfect-mobile-app-user-interface/
   https://www.smashingmagazine.com/2018/02/comprehensive-guide-to-mobile-app-design/
   e. https://www.mockplus.com/blog/post/ui-grid-layout-design#:~:text=Grids%20work%20as%20a%20framework,more%20consistent%20and%20appealing%20 UIs.
   a. https://careerfoundry.com/en/blog/ui-design/introduction-to-color-theory-and-color-palettes/
   b. Access UI kits, plugins and app integrations (adobe.com)
   c. https://github.com/mui-org/material-ui
6. Interaction Design:
   a. https://www.smashingmagazine.com/2018/03/guide-wireframing-prototyping/
   b. https://medium.theuxblog.com/11-best-prototyping-tools-for-ui-ux-designers-how-to-choose-the-right- one-c5dc69720c47
   c. https://careerfoundry.com/en/blog/ux-design/what-is-a-heuristic-evaluation-in-

ux/#:~:text=A%20heuristic%20evaluation%20is%20a,is%20evaluated%20by%20usability%20experts.

d. https://designforfounders.com/web-app-ux/
e. https://uxplanet.org/best-practices-in-mobile-app-design-in-2020-7f5026818ade
f. https://www.toptal.com/designers/ux/mobile-ux-design-best-practices

7. Usability Testing:
   a. https://www.nngroup.com/articles/usability-testing-101/

Online Courses: NPTEL / Swayam:

1. UI By Prof. Saptarshi Kolay | IIT Roorkee
   https://archive.nptel.ac.in/courses/124/107/124107008/

2. Virtual Lab:
   Creative Design, Prototyping & Experiential Lab
   https://cpe-iitg.vlabs.ac.in/

Evaluation Scheme:

Semester End Examination (A):

Laboratory: Oral and practical examinations will be based on the entire syllabus including the Miniproject completed during laboratory sessions

Laboratory: (Term work)

Laboratory work will be based on **DJ19ICL603** consist of Mini project.

The distribution of marks for term work shall be as follows:

1. Laboratory work (Performance of Task): 10 Marks
2. Mini project (Write-up, Power Point Presentation): 10 marks
3. Attendance(Practical):5 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Program: B.Tech. CSE in IoT and Cyber Security with Blockchain Technology **T.Y. B.Tech. Semester: VI**

Course: Innovative Product Development IV (DJ19ILL2)

Objectives:

1. To acquaint the students with the process of identifying the need (considering a societal requirement) and ensuring that a solution is found out to address the same by designing and developing an innovative product.
2. To familiarize the students with the process of designing and developing a product, while they work as part of a team.
3. To acquaint the students with the process of applying basic engineering fundamentals, so as to attempt at the design and development of a successful value added product.
4. To inculcate the basic concepts of entrepreneurship and the process of self-learning and research required to conceptualise and create a successful product.

Outcome: Learner will be able to:

1. Identify the requirement for a product based on societal/research needs.
2. Apply knowledge and skills required to solve a societal need by conceptualising a product, especially while working in a team.
3. Use standard norms of engineering concepts/practices in the design and development of an innovative product.
4. Draw proper inferences through theoretical/ experimental/simulations and analyse the impact of the proposed method of design and development of the product.
5. Develop interpersonal skills, while working as a member of the team or as the leader.
6. Demonstrate capabilities of self-learning as part of the team, leading to life-long learning, which could eventually prepare themselves to be successful entrepreneurs.
7. Demonstrate product/project management principles during the design and development work and also excel in written (Technical paper preparation) as well as oral communication.

Guidelines for the proposed product design and development:

1. Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).

2. Students should carry out a survey and identify the need, which shall be converted into conceptualization of a product, in consultation with the faculty supervisor/head of department/internal committee of faculty members.
3. Students in the team shall understand the effective need for product development and accordingly select the best possible design in consultation with the faculty supervisor.
4. Students shall convert the best design solution into a working model, using various components drawn from their domain as well as related interdisciplinary areas.
5. Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 2 semesters, wherein the main focus shall be on self-learning.
6. A record in the form of an activity log-book is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
7. The design solution is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department. Efforts are to be made by the students to try and publish a technical paper, either in the institute journal, "Techno Focus: Journal for Budding Engineers" or at a suitable publication, approved by the department research committee/ Head of the department.
8. The focus should be on self-learning, capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over two semesters, i.e. during the semesters V and VI.

Guidelines for Assessment of the work:

1. The review/ progress monitoring committee shall be constituted by the Head of the Department. The progress of design and development of the product is to be evaluated on a continuous basis, holding a minimum of two reviews in each semester.
2. In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.

Distribution of term work marks during the subsequent semester shall be as given below:

1. Marks awarded by the supervisor based on log-book :10
2. Marks awarded by review committee: 10
3. Quality of the R: 05

In the last review of the semester VI, the term work marks will be awarded as follows.

1. Marks awarded by the supervisor (Considering technical article): 15
2. Marks awarded by the review committee: 10

Review/progress monitoring committee may consider the following points during the assessment.

- In the semester V, the entire design proposal shall be ready, including components/system selection as well as the cost analysis. Two reviews will be conducted based on the presentation given by the student's team.
- First shall be for finalization of the product selected.
- Second shall be on finalization of the proposed design of the product.

In the semester VI, the expected work shall be procurement of components/systems, building of the working prototype, testing and validation of the results based on work completed in semester V.

- First review is based on readiness of building the working prototype.
- Second review shall be based on a presentation as well as the demonstration of the working model, during the last month of semester V. This review will also look at the readiness of the proposed technical paper presentation of the team.

The overall work done by the team shall be assessed based on the following criteria;

1. Quality of survey/ need identification of the product.
2. Clarity of Problem definition (design and development) based on need.
3. Innovativeness in the proposed design.
4. Feasibility of the proposed design and selection of the best solution.
5. Cost effectiveness of the product.
6. Societal impact of the product.
7. Functioning of the working model as per stated requirements.
8. Effective use of standard engineering norms.
9. Contribution of each individual as a member or the team leader.
10. Clarity on the write-up and the technical paper prepared.

The semester reviews (V and VI) may be based on relevant points listed above, as applicable.

Guidelines for Assessment of Semester Reviews:

- The write-up should be prepared as per the guidelines given by the department.
- The design and the development of the product shall be assessed through a presentation and demonstration of the working model by the student team to a panel of Internal and External Examiners, preferably from industry or any research organisations having an experience of more than five years, approved by the Head of the Institution. The presence of the external examiner is desirable only for the 2nd presentation in semester VI.
- Students are compulsorily required to present the outline of the technical paper prepared by them during the final review in semester VI.

Prepared by Checked by Head of the Department Principal