Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

SYLLABUS

B. Tech. Seventh Semester- Computer Science & Engineering

(INTERNET OF THINGS)

SYLLABUS

B.TECH. (COMPUTER SCIENCE AND ENGINEERING- INTENET OF THINGS)

SEVENTH SEMESTER

		11-07-2023	1.00	Applicable for AY 2023-24 Onwards
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Sl. No.	Board of Studies (BOS)	Courses (Subject)	Category	Course Code	Period per Week			Scheme of Examination Theory/Lab			Total Marks	Credit
					L	T	P	ESE	CT	TA		
1	Computer Science & Engineering	Cryptography and Network Security	PCC	CS102701	2	1	-	100	20	30	150	3
2	Computer Science & Engineering	Introduction to Security of Cyber-Physical Systems	PCC	CS115702	2	1	-	100	20	30	150	3
3	Computer Science & Engineering	Ubiquitous Sensing, Computing and Communication	PCC	CS115703	3	-	-	100	20	30	150	3
4	Computer Science & Engineering	Professional Elective- III	PEC	Refer Table-I	3	-	-	100	20	30	150	3
5	Computer Science & Engineering	Open Elective-II	OE	Refer Table-II	3	-	-	100	20	30	150	3
6	Computer Science & Engineering	Cryptography and Network Security Lab	LC	CS115791	-	-	2	25	-	25	50	1
7	Computer Science & Engineering	Android Lab	LC	CS115792	-	-	2	25	-	25	50	1
8	Computer Science & Engineering	Capstone Project Phase I	PROJ	CS100793	-	-	4	50	-	50	100	2
9	Computer Science & Engineering	Internship assessment/Industrial training (Report and Seminar)	MC	CS100794	-	-	2	-	-	25	25	1
10	Computer Science & Engineering	Universal Human Values and Professional Ethics	NC	CS100795	-	-	-	-	-	25	25	-
	Total				**13**	**2**	**10**	**600**	**100**	**200**	**1000**	**20**

L : Lecture, T: Tutorial, P : Practical, ESE : End Semester Exam CT : Class test TA: Teacher's assessment
PCC-Professional Core CoursesPEC- Professional Elective Courses OE- Open Elective LC- Laboratory Course
PROJ-Project MC-Mandatory Courses NC-Non Credit

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Table-I: Professional Elective – III [7th Sem]

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code
1	Computer Science and Engg.	Internet and Web Technology	CS102721
2	Computer Science and Engg.	Natural Language Processing	CS110722
3	Computer Science and Engg.	Object Oriented Database Management System	CS111723
4	Computer Science and Engg.	Industrial IOT	CS115724
5	Computer Science and Engg.	AI in Gaming	CS114725

Table-II: Open Elective – II [7th Sem]

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code
1	Computer Science and Engg.	Advance Statistical Methods	CS100741
2	Computer Science and Engg.	Enterprise Resource Planning	CS100742

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Subject Code	Cryptography & Network Security	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: **1.** To understand the principles and practices of cryptography and network security **2.** To understand the practical applications that have been implemented and are in use to provide network Security	**Students will be able to:** **CO1** Understand the Conventional encryption algorithms for confidentiality and their design principles **CO2** Understand the Public key encryption algorithms and their design principles **CO3** Understand the Use of message authentication codes, hash functions, digital signature and public key certificates **CO4** Understand the Network security tools and applications **CO5** Understand the System-level security issues like threat of and countermeasures for intruders and viruses, and the use of firewalls and trusted systems.

UNIT 1: Overview: Security trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. **Symmetric (Private Key) Ciphers:Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. **Block Ciphers and the Data Encryption Standard:** Block Cipher Principles, The Data Encryption Standard (DES), The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles.	**CO1** **7 Hrs**

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UNIT 2: Symmetric Ciphers (continued): **Basic Concepts in Number Theory and Finite Fields:** Groups, Rings, and Fields, Modular Arithmetic, the Euclidian algorithm, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2n). **Advanced Encryption Standard:** The Origins AES, Evaluation criteria for AES, the AES Cipher. **Stream cipher:** Stream ciphers and RC4. **Confidentiality using symmetric encryption:** Placement of encryption function, traffic confidentiality, key distribution.	**CO2** **8 Hrs**
UNIT 3:Asymmetric (Public Key) Ciphers: Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms. **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems. **Key Management-Other Public-Key Cryptosystems:** Key management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.	**CO3** **7 Hrs**
UNIT 4:Asymmetric Ciphers (continued): Message Authentication and Hash functions: Message authentication requirements, authentication functions, Message authentication codes, Hash functions, Security of Hash functions and MAC, SHA, HMAC, CMAC. **Digital Signatures and Authentication protocols**: Digital signature, Authentication protocols, Digital signature standards.	**CO4** **7 Hrs**
UNIT 5:Network Security applications: Authentication applications: Kerberos, X.509 Authentication services, public key infrastructure. **Electronic mail security**: PGP, S/MIME. Overview of IP Security. **Web Security**: Web security considerations, SSL and TLS, Secure electronic transaction. **System Security:** Intruders, Intrusion detection, password management, viruses and related threats, virus counter measures, Firewall design principles, and trusted systems.	**CO5** **7 Hrs**

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Cryptography and Network Security, Principles and Practices	William Stallings	Pearson Education,Prentice Hall, 4th Edition.
2	Cryptography and Network Security	AtulKahate	McGraw Hill Education (India) Private Limited; Thirdedition.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Applied Cryptography: Protocols & Algorithms	Schneier& Bruce,	MGH International
2	Cryptography and Security	Dr T R Padmanabhan N Harini	Wiley India Pvt Ltd, 2011

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Subject Code	Introduction to Security of Cyber-Physical Systems	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: **1.** To learn the basics of security and various types of security issues. **2.** To study different cryptography techniques available and various security attacks. **3.** Explore network security and how they are implemented in real world. **4.** To get an insight of various issues of Web security and biometric authentication	**Students will be able to:** **CO1** To Apply basics of security and issues related to it. **CO2** To use biometric techniques available and how they are used in today's world. **CO3** To investigate Security issues in web and how to tackle them **CO4** To Learn mechanisms for transport and network security. **CO5** To Learn platform components for cyber physical system.

UNIT 1: Overview of Security and Privacy in Information System: Applied Cryptography & Intrusion Detection, Architecture of Applied Cryptograph.	**CO 1** **6Hrs**
UNIT 2: One Way Hash Function and Integrity: Encryption Algorithms and Confidentiality, Digital Signature and Authentication (DH, RSA, 2 class), Intrusion Detection and Information Theory.	**CO2** **8 Hrs**
UNIT 3: Internet of Things Security: Security and Privacy for IoT Case Study: Smart Home, Smart Grid Network, Modern Vehicle, Wearable Computing & BYOD, Mobile	**CO3** **7 Hrs**

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HealthCare	
UNIT 4: Software-Defined Networks: Introduction of Software-Defined Networks, Security for Software-Defined Networks, Privacy Leakages for Software-Defined Networks, Case Studies: How to Attack Software-Defined Networks.	**CO4** **8Hrs**
UNIT 5: Cyber-Physical Systems (CPS): CPS - Platform components, CPS implementation issues, Intelligent CPS Secure Deployment of CPS.	**CO5** **7Hrs**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Cyber Security	Nina Godbole	John Wiley & Sons
2	Securing the Internet of Things	Li Da Xu, Shancang Li	Syngress

Reference Books:

S. No.	Title	Author(s)	Publisher
1	IoT Security Issues	Alasdair Gilchrist	De Gruyter
2	The Internet of Risky Things	Sean Smith	Sean Smith, Shroff Publisher/O'Reilly Publisher

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Subject Code	Ubiquitous Sensing, Computing and Communication	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wireline protocols, Mobile to Electronics integration, Mobile to enterprise integration. 2. To have an understanding of basics of open source/commercial electronics platform for IoT. 3. To have an understanding of basics of open source /commercial enterprise cloud platform for IoT	**Students will be able to:** **CO1** To understand merging technological options, platforms and case studies of IoT implementation in home & city automation **CO2** To determine the Market perspective of IoT **CO3** To understand the various types of computing in ubiquitous sensing. **CO4** To understand the apps and open challenges related to IOT. **CO5** To understand the analytics and management of data related to IOT.

UNIT 1: Introduction: Overview, Challenges in IoT, Networking Basics of IoT, NFC,	**CO1** **4Hrs**

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Wireless LAN.	
UNIT 2:Location in ubiquitous computing: Personal assistants, Location aware computing, Location tracking, Architecture, Location based service and applications, Location based social networks (LBSN), LBSN Recommendation. Context-aware computing: Context and Context-aware Computing, Issues and Challenges, Developing Context-aware Applications, System Architecture.	**CO2** **8 Hrs**
UNIT 3: Privacy and security in ubiquitous computing, Energy constraints in ubiquitous computing. Wearable computing, Glass and Augmented Reality, Eye-Tracking, Digital Pen and Paper, Mobile social networking & crowd sensing, Event based social network	**CO3** **8Hrs**
UNIT 4: Mobile affective computing: Human Activity and Emotion Sensing, Health Apps, Mobile p2p computing, Smart Homes and Intelligent Buildings, Mobile HCI, Cloud centric IoT, Open challenges, Architecture, Energy Efficiency, Participatory sensing, Protocols, QoS, QoE	**CO4** **8Hrs**
UNIT 5: IoT and data analytics IoT and Data Management, Data cleaning and processing, Data storage models. Search techniques, Deep Web, Semantic sensor web, Semantic Web Data anagement, Searching in IoT. Real-time and Big Data Analytics for The Internet of Things, Heterogeneous Data Processing, High-dimensional Data Processing, Parallel and Distributed Data Processing.	**CO5** **8Hrs**

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Ubiquitous Computing Fundamentals	John Krumm	CRC Press
2	Enterprise IoT	Shroff Publisher/O'Reilly Publisher	Shroff Publisher/O'Reilly Publisher

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Ubiquitous Computing and Computing Security of IoT	N. Jeyanthi, Ajith Abraham, Hamid Mcheick	Springer Cham

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Subject Code	Industrial IOT	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application. 2. Knowledge for the design and analysis of Industry 4.0Systems for Electronics Engineering students	**Students will be able to:** **CO1**Analyze and discuss the effects of electronic communication on our language. **CO2** Ability to identify, formulate and solve engineering problems by using Industrial IoT. **CO3**Ability to implement real field problem by gained knowledge of Industrial applications with IoT capability. **CO4**Analyze and discuss next generation sensors and AR,VR concepts. **CO5**Understand industrial applications and analyse the case studies of IIOT.

UNIT 1: Introduction to Industrial IoT (IIoT) Systems: The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factorie	**CO 1** **7 Hrs**
UNIT 2: Implementation systems for IIoT: Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa	**CO2** **8 Hrs**

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Protocols and IoT Hub systems.	
UNIT 3:IIoT Data Monitoring & Control: IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology	**CO3** **7 Hrs**
UNIT 4: Cyber Physical Systems: Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis	**CO4** **7 Hrs**
UNIT 5: Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management **Case Studies of IIoT Systems:** IIoT application development with Embedded PC based development boards, Development of mini Project on new version of Operating systems and Edge development board. .	**CO5** **7 Hrs**

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Text Books:

S. No.	Title	Author(s)	Publisher
1	Industry 4.0: The Industrial Internet of Things	Alasdair Gilchrist	Publications: Apress
2	The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics	Bartodziej, Christoph Jan Springer	Publication in the field of economic science.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Embedded System: Architecture, Programming and Design	Rajkamal	TMH3
2	*Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems*	Dr.OvidiuVermesan, Dr. Peter Friess	River Publishers

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Subject Code CS115791	Cryptography and Network Security Lab	L=0	T=0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3Hours

Course Objectives	Course Outcomes
Course Objectives: 1. To understand principles of web security and to guarantee a secure network bymonitoring and analysing the nature of attacks through cyber/computer forensicssoftware/tools 2. Exhibit knowledge to secure comipted systems, protect personal data, and securecomputernetworksinan Organization	**Students will be able to:** **CO1** Analyse and evaluate the cyber security needs of an organization. **CO2** Determine and analyse software vulnerabilities and security solutions to reduce theRisk of exploitation. **CO3** Ensure the performance and troubleshoot cyber security systems **CO4** To have the ability to compare merits merits and demerits of different Cryptographic techniques. **CO5** To have ability to take decisions while securing a network.

List of Experiments (12 Hours)

1. Perform encryption, decryption using the following substitution techniques

a) Ceaser cipher

b) Playfair cipher

c) Hill Cipher

d) Vigenere cipher

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2. Perform encryption and decryption using following transposition techniques
   a) Rail fence
   b) Row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implement RSA Algorithm using HTML and JavaScript .
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware
    i. Building Trojans
    ii. Rootkit Hunter

Text Books:

S.No.	Title	Author(s)	Publisher
1	Cryptography and Network Security, Principles and Practices	William Stallings	Pearson Education,Prentice Hall, 4th Edition.
2	Cryptography and Network Security	AtulKahate	McGraw Hill Education (India) Private Limited; Thirdedition.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Applied Cryptography: Protocols & Algorithms	Schneier& Bruce,	MGH International
2	Cryptography and Security	Dr T R Padmanabhan N Harini	Wiley India Pvt Ltd, 2011
3	Build Your Own Security Lab A Field Guide for Network Testing	Michael Gregg	Wiley Publishing, Inc.

Software Download Links:

- Visual Studio Code:https://code.visualstudio.com/download
- Snort- https://www.snort.org/downloads
- N-Stalker - https://www.nstalker.com/products/editions/free/download/
- GMER- http://www.gmer.net/
- JAVA- https://www.java.com/en/download/

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Subject Code (CS115791)	Android Lab	L=0	T=0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Understanding the working of Android applications 2. To learn how to create GUI and handle events in Android applications. 3. Understanding development of applications with data storage, APIs and Databases	**Students will be able to:** **CO1** Understands basic concepts and technique of developing applications for the Android phone. **CO2** Able to use the SDK and other development tools. **CO3** Acquaintances with how to publish Android applications to the Android Market. **CO4** Creating intuitive, reliable mobile apps using the android services and components. **CO5** Creating intuitive, reliable mobile apps using the android services and components.

List of Experiments (12 Hours)

1. Download and setup Android Environment
2. Using the Development environment
   a) Create a new Project using wizard
   b) Add source and resource files.
   c) Import existing projects into workspace
   d) Create testing Emulator
   e) Compile and run the project

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f) Debug the project

g) Debug on android device.

3. XML Files

a. AndroidManifest.xml

a.i. Edit the manifest and change min sdk and target sdk of application.

a.ii. Add main activity entries in manifest.

a.iii. Add second activity entries in manifest.

a.iv. Add Entries for Service, Broadcast receivers.

a.v. Add uses permissions for reading files, internet, camera

. b. Layouts

b.i. Create Linear Layout in xml

b.ii. Create Relative Layout in xml

b.iii. Create frame layout in xml

b.iv. Create a complex mixed layout using all above layouts

c. Drawables

c.i. Create xml drawable for rectangular, oval and other basic shapes

c.ii. Create xml drawable with Layer list for complex shapes.

d. Values

d.i. Create strings.xml to store all your application strings.

d.ii. Create color.xml to store all your color values

d.iii. Create styles.xml to store all your custom themes and style objects

e. Alternate resources based on qualifiers

e.i. Create separate drawables folders and xml files based on screen density (LDPI, MDPI, HDPI, XHDPI, XXHDPI)

e.ii. Create separate styles.xml based on different android versions.

e.iii. Create separate layout folders based on device screen sizes and orientations.

4. Creating User Interface

i. Create application with Basic Views (Textview, Button, ListView)

ii. Create application with different Layouts (Linear, Relative, Frame)

iii. Create application to handle and respond on click using Click Listeners

5. Assets and Images

i. Create application which will access files from Assets folder (Images, sounds, Custom Fonts)

6. Application Fundamentals

a. Activities

a.i. Create application with one activity and display a layout created in xml.

a.ii. Create application which will log all activity lifecycle events using Android log api.

a.iii. Create application which should be Saving and restoring app state (egtextview text, checkbox checked state)

b. Intents

b.i. Create application which will start another activity using intent.

b.ii. Create an activity which will pass data to second activity using intent.

b.iii. Create activity which will start second activity and get response back from second activity.

c. Services

c.i. Create

7. Content Providers

a. System provided content providers

a.i. Create application which can access/modify Contacts of device.

a.ii. Create application which can access & display Images available on device.

a.iii. Create application which can access and play Media files (Audio & Video)

b. Custom Contact providers

b.i. Create application which will provide some data to other applications using ContentProvider system.

8. Broadcast Receivers

a. Create application to Listen to following system events using Receivers

a.i. Incoming SMS

a.ii. In and outgoing Phone Call

a.iii. Low Battery

a.iv. Storage state changed

b. Create application which will broadcast Custom event to custom Receivers.

9. Create application which will display following Notifications

a.i. Toast notification

a.ii. Status bar notification

a.iii. Dialog notification

10. Preference & Data Storage

a. Create application which will save and read back data using Shared Preference

b. SQLite database

b.i. Create app to create database using Open helper

b.ii. Create app to read, write and delete database entries .

11. Networking & Web API

a. HTTP connectivity

a.i. Create app to connect and fetch data from a Http server/ website using URLConnection

a.ii. Create app to connect and fetch data from a Http server/ website using HTTPClient library

a.iii. Create app to connect and post data to Http server/ website using URLConnection

a.iv. Create app to connect and post data to Http server/ website using HTTPClient library

b. TCP Sockets or Sockets

b.i. Create a server app using tcp socket, it will send “Welcome” to client when its connected.

b.ii. Create a client app using tcp socket, it will send “Hello” to server once connected.

12. Google API

a. Create application using Maps api, it should display marker on current location of user

b. Create application which will display ads using Admobapi

13. Accessing android hardware

a. Create Application to take picture and save it to file storage using camera api

b. Create application to display current direction using sensor api

c. Create application to show a toast if phone is waved in air.

d. Create application to show list of paired and nearby bluetooth devices.

14. Facebook SDK

a. Create application which can share link on facebook using Facebook sdk.

b. Create application which can share photo on facebook using Facebook sdk.

15. Publish to playstore

a. Enable Obfuscation for your application using Proguard

b. Export Signed application package

c. Prepare Store listing d. Upload and publish apk.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Headfirst Android Development	Dawn Griffiths	O'Reilly
2	Android Programming for Beginners	John Horton	Packt Publishing

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Head First Android	Jonathan Simon	O'Reilly Media
2	Android Programming with Kotlin for Beginners	John Horton	Packt Publishing Limited

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Subject Code	Capstone Project Phase I	L=0	T=0	P = 4	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	50	0	50	100	3 Hours

Guideline for Allocation of project(24 Hours)

1. Information regarding broad area must be made available to the students well in advance (may be during previoussemester).

2. Information must cover following parameters. I. Broad area: Subject or expertise/application area. II. Required skills: Knowledge of subject(s), software, tools & other characteristics. III. Type of project: Hardware, software, design, survey, study based etc. IV. Guide available: Name of Guide (S) from Department & Institute. V. Other related information depending upon specific branch & institute.

3. It is also recommended to give proper counseling to pick up suitable project.

4. Students must get chance to select projects as per their choice or decided mutually between students anddepartment faculty (HoD) concern.

5. One project group must contain maximum four students, however students can do project individually but it shouldbe approved by department.

6. Compiled list of projects must be submitted to the University within 25 days of start of semester.

7. Compiled list may contain following parameters.

Monitoring of project:

1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outsideperson/agency.

2. Project must be allocated, developed and monitored by department / institution itself, but not by outside

agencies.

3. Regular review by guide is recommended to ensure development & contribution of students. Internal

Evaluation & Submission of project:

1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.

2. Internal assessment requires submission of project report for getting approved by the concern authority. However printing and binding would be as per the conventional format.

3. Evaluation will be based on live demonstration / presentation and Viva.

4. Final submission of project is expected as, Submission of a copy to the University,• One copy to the Institution central library,• One copy to the department.•

External Evaluation:

External assessment of project would be like conduction of practical exams of University, and must be executed asper the norms of practical exams.

NOTE: Completion of Project outside the department/Institution should not be encouraged

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rofessional Elective-III

Subject Code CS102701	Internet and Web Technology	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
1. Describe the important features of the Web and Web browser software 2. Evaluate e-mail software and Web-based e-mail services 3. Use FTP and other services to transfer and store data 4. Demonstrate the use of real-time chat and briefly describe the history of the wireless Internet 5. Create HTML documents and enhance them with browser extensions	**Students will be able to:** **CO1** Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, and web applications **CO2** Analyze a web page and identify its elements and attributes. **CO3** Create XML documents and XML Schema. **CO4** Learn about various security issues. **CO5** Will be able to plan and host websites.

UNIT-I INTRODUCTION TO INTERNET: Introduction, Evolution of Internet, Internet Applications, Internet Protocol -TCP/IP, UDP, HTTP, Secure Http(Shttp) Internet Addressing – Addressing Scheme – Ipv4 & IPv6, Network Byte Order, Domain Name Server and IP Addresses, Mapping . Internet Service Providers, Types Of Connectivity Such As Dial-Up Leaded Vsat Etc. Web Technologies: ThreeTier Web Based Architecture; Jsp, Asp, J2ee, .Net Systems	**CO1** **8Hrs**

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UNIT-II HTML CSS AND SCRIPTING: HTML - Introduction, Sgml, Dtd(Document Type Definition, Basic Html Elements, Tags and usages, HTML Standards , Issues in HTML Dhtml: Introduction Cascading Style Sheets: Syntax ,Class Selector, Id Selector Dom (Document ObjectModel) &DSO (Data Source Object) Approaches To Dynamic Pages: Cgi, Java Applets, Plug Ins, Active X, Java Script –Java Script Object Model, Variables-Constant – Expressions, ConditionsRelational Operators- Data Types – FlowControl – Functions & Objects-events and event handlers – Data type Conversion & Equality – Accessing HTML form elements	**CO2** **8Hrs**
UNIT-III XML: What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards thatbuild on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents&Data ,DefiningAttributes & Entities in the DTD ,Defining Parameter Entities & conditional Sections, Resolving a namingconflict, UsingNamespaces, Designing an XML data structure, Normalizing Data, NormalizingDTDS	**CO3** **8 Hrs**
UNIT-IV INTERNET SECURITY & FIREWALLS: Security Threats From Mobile Codes, Types Of Viruses, ClientServer Security Threats, Data & Message Security, Various electronic payment systems, Introduction to EDI, Challenges–Response System, Encrypted Documents And Emails,Firewalls: Hardened Firewall Hosts, Ip- Packet Screening, ProxyApplication Gateways, Aaa (Authentication, AuthorizationAnd Accounting).	**CO4** **8Hrs**
UNIT-V WEBSITE PLANNING & HOSTING: Introduction, Web Page Lay-Outing, Where To Host Site, MaintenanceOf Site, Registration Of Site On Search Engines And Indexes, Introduction To File Transfer Protocol, Public DomainSoftware, Types Of Ftp Servers (Including Anonymous),Ftp Clients Common Command. Telnet Protocol, Server Domain,Telnet Client, Terminal Emulation. Usenet And Internet Relay Chat.	**CO5** **8 Hrs**

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S. No.	Title	Author(s)	Publisher
1	Internet & Intranet Engineering	Daniel Minoli	TMH
2	Internet for Every One	Alexis Leon and Mathews Leon	Tech World

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Using HTML 4, XML and JAVA	Eric Ladd, Jim O'Donnel	Prentice Hall of India -1999
2	Beginning Java Script	Paul Wilton	SPD Publications
3	Frontiers of Electronics of Commerce	Ravi kalakota& Andrew B. Whinston	Addison Wesley

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Subject Code CS110722	Natural Language Processing	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: **1.** To understand the concepts of morphology, syntax, semantics and pragmatics of the language. **2.** To recognize the significance of pragmatics for natural language understanding. **3.** To describe the simple system based on logic and demonstrate the difference between the semantic presentation and interpretation of that presentation. **4.** To describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.	**Students will be able to:** **CO1** Understand language and the tools that are available to efficiently study and analyze large collections of text. **CO2** Analyze and discuss the effects of electronic communication on our language. **CO3** Learn natural language processing with manual and automated approaches. **CO4** Learn computational frameworks for natural language processing.

UNIT 1 Introduction:A computational framework for natural language, description of English or an Indian language inthe frame work, lexicon, algorithms and data structures for implementation of the framework, Finitestate automata, the different analysis levels used for NLP (morphological, syntactic, semantic,pragmatic, Recursive and augmented transition networks. Applications like machine translations.	**CO1** **7 Hrs**
UNIT 2 WordLevel& Syntactic Analysis:Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of Speech Tagging.	**CO2** **8 Hrs**

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Syntactic Analysis: Context-free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine readable dictionaries and lexical databases, RTN, ATN.	
UNIT 3 SemanticAnalysis:Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.	**CO3 7 Hrs**
UNIT 4 Natural Language Generation:Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG. Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.	**CO4 7 Hrs**
UNIT 5 Information Retrieval & Lexical Resources: Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.	**CO5 7 Hrs**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Natural Language Understanding	James Allen	Pearson Education, 2002
2	NLP: A Paninian Perspective	AksharBharati, VineetChaitanya, and Rajeev Sangal	Prentice Hall, 2016
3	Meaning and Grammar	G. Chirchia and S. McConnell Ginet	MIT Press, 1990

Reference Books:

S. No.	Title	Author(s)	Publisher
1	An Introduction to NLP, CL&SR	Daniel Jurafsky and James H. Martin	Pearson Education, 2006.
2	Natural language processing in Prolog	Gazdar, &Mellish	Addison-Wesley

Alternative NPTEL/SWAYAM Course (if any):

S. No.	NPTEL Course Name	Instructor	Host Institute
1	Natural Language Processing	Prof. PawanGoyal	IIT Kharagpur
2	Natural Language Processing	Prof. Pushpak Bhattacharya	IIT Bombay

Web Reference:https://www.coursera.org/specializations/natural-language-processing

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Subject Code CS111723	Object Oriented DBMS (OODBMS)	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. This course discusses the requirements for advanced database features in database applications. 2. Introduce Parallel and Distributed databases. 3. Understand the enhanced data models for advanced applications. 4. Examines the concepts of various emerging database technologies.	**Students will be able to:** **CO1**.Able to understand the needs and concepts of object-oriented database, spatial database, web database, data warehousing and data mining. **CO2**.Able to analyze, design and evaluate the construct of various advanced databases such as object-oriented, object-relational, semi-structured, unstructured and distributed databases. **CO3**.Be able to implement practical solutions to GIS database problems using OO/OR database, spatial database, data warehousing and data mining approaches. **CO4.** Be able to understand the architecture and design of client server, parallel and distributed database. **CO5.** Be able to understand the concept of web and structured data like XML.

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UNIT 1: : The extended Entity- Relationship Model and Object model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.	**CO 1** **7Hrs**
UNIT 2: Object oriented databases: Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS.	**CO 2** **8 Hrs**
UNIT 3: Object relational and extended relational databases: Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; An overview of SQL3, Implementation issues for extended type; Systems comparison of RDBMS, OODBMS, ORDBMS	**CO 3** **7 Hrs**
UNIT 4: Parallel and distributed database and Client server architecture: Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases. An overview of Client-Server architecture.	**CO 4** **7 Hrs**
UNIT 5: Databases on the web and semi structured data: Web interfaces to the Web, Overview of XML; Structure of XML data, Document schema, Querying XML data; Storage of XML data, XML applications; The semi structured data model, Implementation issues, Indexes for text data. Enhanced Data Models for Advanced Applications: Active database concepts. Temporal database concepts. Spatial databases, Concepts and architecture; Deductive databases and Query processing; Mobile databases, Geographic information systems.	**CO 5** **7 Hrs**

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Text Books:

S.No.	Title	Author(s)	Publisher
1	Object Oriented Interfaces and Databases	Rajesh Narang	Prentice Hall of India
2	Database Management Systems, Raghu Ramakrishnan	Johannes Gehrke	McGraw-Hil

Reference Books:

S.No.	Title	Author(s)	Publisher
1	Fundamentals of Database Systems	Elmasri and Navathe	Pearson Education
2	Database System Concepts	Korth, Silberchatz, Sudarshan	McGraw-Hill

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Subject Code CS114724	AI in Gaming	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The students should be able to understand and use AI techniques for generating efficient, intelligent behaviour in games. Additional attention is to be given to AI algorithms for improving game play experience.	**After completion of course, students would be able to:** **CO1** Understand identify tasks that can be tackled using AI techniques. **CO2** Apply appropriate AI technique for the problem under investigation. **CO3** Create efficient and robust AI algorithms for game tasks. **CO4** Apply learning mechanisms to gaming problems. **CO5** Apply AI algorithms for improving game play experience.

Unit 1: Introduction

Introduction to Game AI, kind of AI used in game development, model of game AI, AI engine structure.

Unit 2: Movement Algorithms and Steering Behavior

kinematic movement algorithms, problems related to the steering behaviour of objects and Solutions. Coordinated Movement and Motor Control This unit discusses the concepts related to coordinated movements and motor control.

Unit 3: Pathfinding

Basic Path finding Algorithms in game development, Path finding for complex solutions

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Unit 4:

Decision-Making and Uncertainty decision trees and state machines for game development, models for implementing knowledge uncertainty, such as fuzzy logic and Markov systems.

Unit 5:

Introduction to Learning Mechanisms Board game theory and discusses the implementation of some key algorithms, such as minimax and negamax, Random Number Generation and Minimaxing, algorithms for implementing action prediction, decision learning and reinforcement learning.

Text Books:

S.No.	Title	Author(s)	Publisher
1	Artificial Intelligence and Games,	Georgios N. Yannakakis and Julian Togelius,	Springer International Publishing, 2018.
2	Artificial Intelligence for Games,	Ian Millington and John Funge,	CRC Press; 2nd edition, 2009.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	https://www.athabascau.ca/syllabi/comp/comp452.php		
2	https://www.udemy.com/course/artificial-intelligence-for-simple-games/		

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Subject Code CS115725	Industrial IOT	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	Course Outcomes
The objective of the course to: 3. To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application. 4. Knowledge for the design and analysis of Industry 4.0Systems for Electronics Engineering students	**Students will be able to:** **CO1**Analyze and discuss the effects of electronic communication on our language. **CO2** Ability to identify, formulate and solve engineering problems by using Industrial IoT. **CO3**Ability to implement real field problem by gained knowledge of Industrial applications with IoT capability. **CO4**Analyze and discuss next generation sensors and AR,VR concepts. **CO5** Understand industrial applications and analyse the case studies of IIOT.

UNIT 1: Introduction to Industrial IoT (IIoT) Systems: The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factorie	**CO 1** **7 Hrs**
UNIT 2: Implementation systems for IIoT: Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with	**CO2** **8 Hrs**

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Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.	
UNIT 3:IIoT Data Monitoring & Control: IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology	**CO3** **7 Hrs**
UNIT 4: Cyber Physical Systems: Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis	**CO4** **7 Hrs**
UNIT 5: Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management **Case Studies of IIoT Systems:** IIoT application development with Embedded PC based development boards, Development of mini Project on new version of Operating systems and Edge development board	**CO5** **7 Hrs**

xt Books:

S. No.	Title	Author(s)	Publisher
1	Industry 4.0: The Industrial Internet of Things	Alasdair Gilchrist	Publications: Apress
2	The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics	Bartodziej, Christoph Jan Springer	Publication in the field of economic science.

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Embedded System: Architecture, Programming and Design	Rajkamal	TMH3
2	Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems	Dr.OvidiuVermesan, Dr. Peter Friess	River Publishers

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Open Elective-II

Subject Code CS100741	Advanced Statistical Method	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: **1.** Ability to summarize and present data numerically and visually. **2.** Knowledge of which statistical methods to use in which situations **3.** Ability to think critically about data-based claims and quantitative arguments **4.** Ability to learn new statistical analysis techniques on your own	**Students will be able to:** **CO1** Apply statistical methods and hypothesis testing to business problems **CO2** Learn the details and complexities of Analysis of Variance (ANOVA) **CO3** Learn some of the details and complexities of Multiple Regression (MR) **CO4** Communicate statistical ideas to a diverse audience. **CO5** Formulate a statistical solution to real-data research problems

UNIT 1 Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement). Sampling distribution of sample mean, stratified random sampling.	**CO1** **7 Hrs**
UNIT 2 Linear Statistical Models: Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Multiple regression& multiple correlation.	**CO2** **7 Hrs**

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Analysis of variance (one way, two ways with as well as without interaction).	
UNIT 3 Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. **Sufficient Statistic:** Concept & examples, complete sufficiency, their application in estimation. **Test of hypothesis:** Concept & formulation. Type 1 and Type II errors, Neyman Pearson lemma, Procedures of testing.	**CO3** **8 Hrs**
UNIT 4 Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test. Kolmogorov-Smirnov test. Spearmans and Kendall's test Tolerance region**.**	**CO4** **7 Hrs**
UNIT 5 Basics of Time Series Analysis & Forecasting: Stationary. ARIMA Models: Identification, Estimation and Forecasting.	**CO5** **7 Hrs**

Text Books:

S. No.	Title	Author(s)	Publisher
1	Probability and Statistics for Engineers (Fourth Edition)	LR. Miller, J.E. Freund and R.Johnson	Prentice Hall India Learning PrivateLimited
2	Fundamentals of Statistics (vol. 1 & vol. II)	A. Goon. M. Gupta and B. Dasgupta.	World Press

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Discovering Statistics Using R.	Field, A., Miles, J., & Field, Z. (2012).	Thousand Oaks, CA: Sage

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Subject Code CS100742	Enterprise Resource Planning	L = 3	T = 0	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 know the basics of ERP and business modules of ERP. • To understand the key implementation issues of ERP. • To be aware of some popular products in the area of ERP. • To appreciate the current and future trends in ERP	**CO1** To know the basics of ERP **CO2** To understand the key implementation issues of ERP **CO3** To know the business modules of ERP **CO4** To be aware of some popular products in the area of ERP **CO5** To appreciate the current and future trends in ERP

Unit-I Introduction: Overview of enterprise systems ñ Evolution - Risks and benefits – Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems. Introduction to SAP

Unit- II ERP Solutions and Functional Modules: Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR and best business practices - Business process Management, Functional modules.

Unit-III ERP Implementation: Planning Evaluation and selection of ERP systems - Implementation life cycle - ERP implementation, Methodology and Frame work- Training ñ Data Migration – People Organization in implementation-Consultants, Vendors and Employees.

Unit-IV Post Implementation: Maintenance of ERP- Organizational and Industrial impact; Success and Failure

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factors of ERP Implementation. Emerging Trends on ERP: Extended ERP systems and ERP add-ons -CRM, SCM, Business analytics - Future trends in ERP systems-web enabled, Wireless technologies, cloud computing.

Unit V ERP and Related Technologies. ERP and Related Technologies. Business Process Reengineering (BPR). Management Information System (MIS). Executive Information System. Decision support System (DSS). Supply Chain Management (SCM) Other Related Technologies of SCM E-Procurement; E-Logistics; Internet Auctions; E-markets; Electronic Business Process Optimization; Business Objects in SCM; E commerce

Text Books:

S. No.	Title	Author(s)	Publisher
1	ERP demystified	Alexis Leon	Tata McGraw-Hill,2008
2	Essentials of Business Process and Information System	Sinha P. Magal and Jeffery Word	Wiley India,2012

Reference Books:

S. No.	Title	Author(s)	Publisher
1	ERP and Supply Chain Management	Christian N. Madu	CHI4
2	Implementing SAP ERP Sales & Distribution	Glynn C. Williams	McGraw-Hill