Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
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Choice Based Credit System (CBCS) in the light of NEP-2020
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SEMESTER-VI (2023-2027)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE613M	**DSE**	**Internet of Things**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Impart necessary and practical knowledge of components of Internet of Things.
2. Develop skills required to build real-life IoT based projects.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Understand internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Remotely monitor data and control devices
4. Develop real life IoT based projects

SYLLABUS

UNIT I **10 HOURS**

Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

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UNIT II **9 HOURS**

Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication. Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT III **8 HOURS**

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT IV **7 HOURS**

Device data storage: Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V **8 HOURS**

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

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TEXTBOOKS:

1. Vijay Madisetti, Arshdeep Bahga, Internet of Things: A Hands on Approach, University Press.
2. Dr. S. R. N. Reddy, Rachit Thukral and Manasi Mishra, Introduction to Internet of Things: A practical Approach, ETI Labs.

REFERENCE:

1. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press
2. Jeeva Jose, Internet of Things, Khanna Publishing House, Delhi.
3. Adrian McEwen, Designing the Internet of Things, Wiley.
4. Raj Kamal, Internet of Things: Architecture and Design, McGraw Hill.
5. Cuno Pfister, Getting Started with the Internet of Things, O Reilly Media.

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BTIBM705	**DSE**	**Private Cloud Deployment**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To explore the considerations for designing and planning a private cloud deployment.
2. To understand the principles and best practices for designing a scalable and resilient private cloud infrastructure.
3. To evaluate different management tools and platforms for private cloud environments.
4. To understand the compliance requirements and frameworks relevant to private cloud deployments.
5. To explore the challenges and considerations in migrating applications and data to a private cloud

Course Outcomes (COs):

The students will be able to

1. Identify the key components and architecture of a private cloud environment
2. Configure networking and storage resources to support a private cloud environment
3. Develop strategies for implementing security controls and ensuring compliance in a private cloud.
4. Learn about the governance frameworks and operational practices for managing a private cloud environment.

Syllabus

UNIT I: Introduction to Private Cloud

Introduction of Cloud Computing, Advantages and Disadvantages of Cloud Computing, Key Components of Cloud Computing, Core Reference Model / Architecture of cloud computing.

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UNIT II: Infrastructure for Private Cloud:
Cloud Deployment models, Concepts of private cloud deployment models, Advantages & Disadvantages of Private Cloud Deployment Model, Factors choosing appropriate deployment models. Comparative analysis of various deployment models. Private cloud Infrastructure Hardware & Software needed for Private Cloud Infrastructure.

UNIT III: Private Cloud Management
Cloud Service Delivery models their Pros and Cons, Overview of other services models: Naas, DEaas, Staas, DBaas, Daas, etc. virtualization techniques used in Private Cloud Deployment. Monitoring and Management of the performance of Private Cloud.

UNIT IV: Security and Compliance in Private Cloud:
Security Challenges and threats associated with Private Cloud Deployment, Techniques for security virtualized environment, Various strategies for implementing security control in Private Cloud. Governance frameworks and operational practices for managing Private Cloud Deployment optimization and cost management in Private Cloud Deployment.

UNIT V: Cloud Migration and Governance
Planning and Execution of a successful Private Cloud Migration, Challenges and Consideration in migrating application and data seven steps model of migration into cloud. Migration risk and mitigation.
Case Study - Microsoft Azure, Google App Engine, Sales Force and Eucalyptus, Open – Nebula, IBM Smart cloud, and open-source clouds.

Text Books:
1. IBM Courseware
2. Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL

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List of Experiments:

1. Install virtual box / VM ware workstation with different of window OS.
2. Install a C Compiler in the virtual machine created using virtual box and execute any simple program.
3. Install Google App Engine. Create Hello World App and other simple web applications using Python / Java
4. Find a procedure to transfer the file from one VM to another VM.
5. Find a procedure to launch VM using Trystack (online-Openstack demo version).
6. To study cloud computing deployment models.
7. To study cloud computing service models
8. To study cloud architecture Anatomy
9. Find a procedure to attach virtual box to a virtual machine.
10. Find procedure to run the VM of different configuration. Check now many VMs can be utilized at time.

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BTIBM513M	**DCC**	**Business Intelligence**	**60**	**20**	**20**	**30**	**20**	**2**	**0**	**2**	**3**

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Course Educational Objectives (CEOs):

The student will have ability to:

1. Gain the depth knowledge of data which helps the industry to take better decision
2. Understand how business analysis Software works to analyze the data.
3. Learn how business Intelligence can be applied.
4. Create reports, dashboards, stories and cross reports and accessing them accordingly.
5. Visualize the data in many forms and ways.

Course Outcomes (COs):

1. The importance of analytics and how its transforming the world today
2. Understand how analytics provided a solution to industries using real case studies
3. Explain what is analytics, the various types of analytics, and how to apply it
4. Understand how a business analysis software works, and its architecture
5. Describe a reporting application, its interface, and the different report types
6. Create different types of advanced reports
7. Understand Active Reports and how to create them

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SYLLABUS

UNIT–I Analytics Overview: **8HRS**

The history of analytics and how it has changed today ,Understanding how to analyze unstructured data ,Understanding how analytics is making the world smarter ,Understanding where the future of analytics lies, Explaining why successful enterprises need business analytics ,Understanding how business analytics can help turn data into insight ,Understanding how predictive analytics is transforming all types of organizations ,Explaining how analytics supports retail companies ,Understanding how analytics can reduce crime rates and accidents ,Explaining the use of analytics in law enforcement and insurance companies ,Understanding how analytics can affect the future of education, Understanding the importance of business analytics ,Comprehend how big data and analytics can help in understanding consumer/customer behavior ,Explaining how analytics can help manage assets ,Understanding how analytics can help combat fraud ,Explaining how analytics can help us to understand social sentiments.

UNIT–II Business Intelligence and Analytics: **8HRS**

Explaining what is analytics, Defining various types of analytics, Demonstrating how to apply analytics, Describing business intelligence, Demonstrating how to apply business intelligence.

UNIT–III Create list reports, Crosstab reports & Present data graphically: **8HRS**

Learning how to access content, use reports, and create dashboards ,Learning how personalize the IBM Cognos Analytics portal, Group, format, and sort list reports ,Describing the various options for aggregating data ,Creating a multi-fact query ,Creating a report with repeated data, Creating filters to narrow the focus of reports ,Examining detail filters and summary filters ,Determining

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when to apply filters on aggregate data, Formatting and sort crosstab reports ,Creating complex crosstab reports using drag and drop functionality ,Creating crosstab reports using unrelated data items, Creating charts containing peer and nested columns ,Presenting data using different chart type options ,Adding context to charts ,Creating and reuse custom chart palettes ,Introduction to visualization ,Presenting key data in a single dashboard report, Identifying various prompt types ,Using parameters and prompts to focus data ,Searching for prompt types ,Navigating between pages, Creating calculations based on the data in the data source ,Adding run-time information to the reports ,Creating expressions using functions, Enhancing report design with report objects ,Reusing objects within the same report ,Sharing layout components among separate reports ,Discussing report templates ,Choosing options to handle reports with no available data, Creating multi-lingual reports ,Highlighting exceptional data ,Showing and hide data ,Conditionally render objects in reports ,Conditionally format one crosstab measure based on another, Knowing how to let users navigate from a specific report to a target report ,Passing parameter values to filter the data in drill-through targets, Navigating through multiple reports, Force page breaks in reports ,Modifying existing report structures ,Applying horizontal formatting ,Specifying print options for PDF reports ,Formatting data and report objects

UNIT–IV IBM Cognos Analytics: 8HRS

Describing IBM Cognos Analytics and its position within an analytics solution ,Describing IBM Cognos Analytics components ,Describing IBM Cognos Analytics at a high level ,Describing IBM Cognos Analytics security at a high level ,Explaining how to extend IBM Cognos Analytics Building query models and connect them to the report layout ,Editing an SQL statement to author custom queries ,Adding filters and prompts to a report using the query model, Creating reports by merging query results ,Creating reports by joining queries ,Combining data containers based on

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relationships from different queries ,Filtering reports on session parameter values ,Navigating a briefing book using a table of contents ,Creating dynamic headers and titles that reflect report data ,Navigating to specific locations in reports ,Creating a customer invoice report ,Controlling report displays using prompts ,Specifying conditional formatting values using prompts ,Specifying conditional rendering of objects based on prompt selection ,Creating sorted and filtered reports based on prompt selection, Creating a report that displays summarized data before detailed data ,Highlighting alternate rows in a list report ,Creating a report using an external data file ,Using single data items to summarize report information, Examining the report specification structure ,Modifying a report specification ,Adding custom toolbox objects and custom template options, Distributing reports using bursting ,Creating burst keys ,Identifying report recipients and data items using burst tables ,Distributing reports using email and the Business Analysis Solution Connection ,Creating tooltips that clarify report data ,Sending emails using links in a report, Describing Active Reports, and their value ,Saving Active Reports

UNIT–V Focus reports using prompts and Extend reports using calculations: 8HRS

Creating Active Reports as prompt pages, Converting existing reports to Active Reports , Explaining security considerations in Active Reports ,Debugging Active Report behavior, Describing active report connections ,Filtering and selecting active report controls, Modifying the interactive behavior of report controls ,Identifying active report controls and variables, Using variables to control multiple controls independently ,Controlling multiple controls from a single variable ,Authoring and optimizing active reports for mobile consumption, Describing characteristics of traditional charts in Active Reports, Controlling data display using decks and data decks ,Using decks and data decks to display traditional charts, Optimizing decks for performance ,Describing characteristics of RAVE visualizations

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TEXT BOOKS:

1. IBM Cognos Business Intelligence 10: The Official Guide
2. IBM Cognos 10 Report Studio Cookbook, Second Edition
3. IBM Cognos 10 Report Studio: Practical Examples

REFERENCES:

1. IBM Material for Business intelligence

LIST OF EXPERIMENTS:

1. Examine list reports ,Group data ,Include list headers and footers ,Format list columns , Enhance a list report, Understand fact/measure data ,Understand aggregate data, Understand difference in aggregation ,Explore data aggregation ,Use shared dimensions to create multi-fact queries ,Create a multi-fact query in a list report ,Add repeated information to reports Create a mailing list report ,Focus reports using filters ,Create filters ,Filter your data with advanced detail filters , Apply filters to a report, Determine when to apply a filter with aggregation , Apply a detail filter on fact data in a report ,Filter your data with summary filters ,Apply a summary filter to a report Using Rational Rose do the following for a given source code. Apply pre-defined source filters, Create a report focused on top performing product types and product lines.

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2. Create a Crosstab report ,Add measures to Crosstab reports ,Data sources for Crosstabs ,Create a simple Crosstab report ,Create complex Crosstab reports ,Create Crosstab nodes and Crosstab node members ,Create complex Crosstab reports ,Format Crosstab reports ,Sort and format a Crosstab reportCreate a Visualization report ,Different chart options ,Create charts containing peer and nested items, Create and reuse custom chart palettes ,Add data-driven baselines and markers to charts, Create and format a chart report , Show the same data graphically and numerically ,Customize charts ,RAVE , Display RAVE visualizations , Create a dashboard report.

3. Examine parameters and prompts, Create a parameter item on the report, Build a prompt page, Add a prompt item to a report ,Create a prompt by adding a parameter.

4. Identify prompt type, add a value prompt to a report ,Add pages to a report ,Add a Select & search prompt to a report ,Create a cascading prompt, Create a cascading prompt, Focus a report using value prompts.

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BTIBM615N	**DCC**	**Fundamentals of Machine Learning**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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Course Outcomes (COs):

1. The Understand fundamental ML concepts and workflows
2. Preprocess and analyze real-world datasets
3. Apply supervised and unsupervised learning algorithms
4. Evaluate and improve ML models
5. Build basic ML applications and deploy models

SYLLABUS

UNIT-I **(10 HRS)**

Introduction to Machine Learning Foundations and Concepts: Introduction to Artificial Intelligence, Data Science, and Machine Learning, Evolution of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning, Applications of Machine Learning in business, healthcare, finance, and industry, ML workflow: Data collection, preprocessing, model training, evaluation, and deployment, Challenges in Machine Learning (bias, overfitting, underfitting)

UNIT-II **(10 HRS)**

Data Preprocessing and Exploratory Data Analysis: Preparing Data for ML Models, Types of data: Structured, semi-structured, unstructured, Data cleaning: handling missing values, outliers, noise, Feature engineering and feature selection, Data normalization and standardization, Exploratory Data Analysis (EDA): summary statistics, correlation analysis, Data visualization techniques using Python libraries (Matplotlib, Seaborn)

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UNIT-III **(10 HRS)**

Supervised Learning Techniques: Predictive Modeling, Regression techniques: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Classification techniques: Logistic Regression, k-Nearest Neighbors (k-NN), Decision Trees, Support Vector Machines (SVM), Model evaluation metrics: Confusion matrix, Accuracy, Precision, Recall, F1-score, ROC and AUC

UNIT- IV **(8 HRS)**

Unsupervised & Ensemble Learning: Pattern Discovery and Model Improvement, Clustering techniques: K-Means, Hierarchical Clustering, DBSCAN, Dimensionality Reduction: Principal Component Analysis (PCA), Association Rule Learning:, Apriori Algorithm, Ensemble Learning: Bagging, Boosting (AdaBoost, Gradient Boosting), Random Forest.

UNIT-V **(7 HRS)**

Advanced ML Concepts & Model Deployment: Advanced ML Concepts & Model Deployment From Models to Real-World Systems, Bias–Variance tradeoff, Cross-validation techniques, Hyperparameter tuning (Grid Search, Random Search), Introduction to Neural Networks and Deep Learning, ML pipelines and automation, Model deployment basics (REST APIs, Flask), Ethical issues and responsible AI

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Text Books:

1. Tom M. Mitchell – Machine Learning
2. Aurélien Géron – Hands-On Machine Learning with Scikit-Learn
3. Ian Goodfellow – Deep Learning
4. Scikit-learn Documentation

List of Practical

1. Setting up Python ML environment (Anaconda, Jupyter Notebook)
2. Data cleaning and preprocessing using Pandas and NumPy
3. Exploratory Data Analysis and visualization
4. Implementing Linear and Logistic Regression
5. Classification using k-NN and Decision Trees
6. Clustering using K-Means and Hierarchical Clustering
7. Model evaluation and performance comparison
8. Hyperparameter tuning using GridSearchCV
9. Building a simple ML pipeline
10. Mini project: End-to-end ML model development and deployment (optional)

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Objectives:

This course is the master's by coursework Minor Project.
A Minor Project is a substantial work of supervised research or development, requiring the equivalent of about four to six months full-time work from start to finish. A Project involves identifying a task or problem, searching and reviewing relevant literature, a proposed, implemented, and critically analyzed solution to the task or problem, and a written report describing the problem, the relevant literature, the solution, and its relation to other work in the area.

Note: This course includes a work integrated learning experience in which your knowledge and skillswill be applied and assessed in a real or simulated workplace context and where feedback from industry and/ or community is integral to your experience.

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

1. Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology
2. Recognize and use research principles and methods applicable to Information Technology.

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BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

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- **Critical Analysis:**

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

- analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems
- Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- **Problem Solving:**

Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:**

You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:**

You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

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BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

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- **Research and Scholarship:**

You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes

Upon successful completion of this course you should be able to:

1. Identify a task or problem relevant to /or IT
2. Search and review of the relevant literature
3. Propose a solution to the task or problem
4. Develop a software and/or algorithmic solution to the task or problem
5. Implement solutions to meet high quality requirements developed by the supervisor
6. Carry out research under supervision
7. Present the research in a written form like that used for published papers
8. Present the research in an oral seminar.

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BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

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Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar.

In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

1. Research project comprising an implemented and critically analyzed solution to the task or problem
2. Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area
3. Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

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BTDSE613P	**DSE**	**Internet of Things Lab**	**0**	**0**	**0**	**30**	**20**	**0**	**0**	**2**	**1**

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COURSE OBJECTIVES:

The student will have ability to:

1. Impart necessary and practical knowledge of components of Internet of Things.
2. Develop skills required to build real-life IoT based projects.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Understand internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Remotely monitor data and control devices
4. Develop real life IoT based projects

SYLLABUS

UNIT I **10 HOURS**

Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

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BTDSE613P	**DSE**	**Internet of Things Lab**	**0**	**0**	**0**	**30**	**20**	**0**	**0**	**2**	**1**

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UNIT II **9 HOURS**

Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication. Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT III **8 HOURS**

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT IV **7 HOURS**

Device data storage: Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V **8 HOURS**

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXTBOOKS:

1. Vijay Madisetti, Arshdeep Bahga, Internet of Things: A Hands on Approach, University Press.
2. Dr. S. R. N. Reddy, Rachit Thukral and Manasi Mishra, Introduction to Internet of Things: A practical Approach, ETI Labs.

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BTDSE613M	**DSE**	**Internet of Things Lab**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

REFERENCE:

1. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press
2. Jeeva Jose, Internet of Things, Khanna Publishing House, Delhi.
3. Adrian McEwen, Designing the Internet of Things, Wiley.
4. Raj Kamal, Internet of Things: Architecture and Design, McGraw Hill.
5. Cuno Pfister, Getting Started with the Internet of Things, O Reilly Media.

List of Experiments:

1. Implementation of LED blinking using Arduino.
2. Interfacing push button with Arduino for digital input operation.
3. Interfacing temperature sensor (LM35/DHT11) with Arduino.
4. Development of LDR-based automatic street light system.
5. Implementation of buzzer alarm system using sensor input.
6. Controlling LED using Bluetooth module (HC-05) and mobile application.
7. Wi-Fi based device control using ESP8266/NodeMCU module.
8. Uploading sensor data to cloud platform using ThingSpeak.
9. Demonstration of MQTT protocol using publish/subscribe communication.
10. Development of simple home automation mini project (light/fan control).

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BTIBMC701	**DCC**	**Web Services**	**60**	**20**	**20**	**0**	**50**	**3**	**0**	**2**	**4**

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COURSE OBJECTIVES

1. To explain the importance of Web Services and Use of XML JAXB and using SOAP and REST Web Services
2. To learn the importance of Spring Boot and JAVA in Web Services
3. Be able to use POSTMAN accessing dummy URLs as well as self created URLs
4. Able to Secure Web Service using Transport layer and Application Level Security

COURSE OUTCOMES

After completion of course, students would be able to:

1. Understand the use of SOAP and REST web services in Enterprises from a global context.
2. To understand and Write SOAP web services from industry perspective of Web Services.
3. Applying and analyzing Restful Web Services.
4. To evaluate the application of REST Web Services in university environment by Using JAX-RS and JAX-WS API's in java.
5. Creating and Securing Web Services by Using Transport and Application level Security. Creating projects and research activities based on SOAP & REST API.

SYLLABUS

UNIT–I WEB SERVICES INTRODUCTION

Introduction to XMl what is Web Services? Why Web Services? Web Services Fundamentals Services Oriented Architecture; HTTP and XML and SOAP WSDL; UDDI; REST; SOAP vs REST JAXB Overview; JAXB Binding Process;

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BTIBMC701	**DCC**	**Web Services**	**60**	**20**	**20**	**0**	**50**	**3**	**0**	**2**	**4**

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UNIT–II INTRODUCTION TO SOAP

SOAP Overview; SOAP Message Exchange Model; Data Encoding, Installing and Configuring Apache SOAP; Server and Client Program; Deployment Descriptor, Describing Web Services with Example; Anatomy of a services; Defining Data types and structures with XML Schemas; Describing Web Services Interface and Implementation; Understanding Message patterns.

UNIT–III JAVA API FOR RESTFUL SERVICES

Introduction to JAVA API; REST and HTTP; Resource URI; Collection URIs; Method Idempotence; What is JAX-RS Introduction to UDDI; UDDI Registry; Technical Architecture; Using UDDI with WSDL.

Dispatching Request to Methods

Creating a Resource; Returing XML Responses; Installing REST API Client; Building Services Stubs;Accessing Path Params; Returning JSON Response; Implementing POST Update and Delete Methods;Pagination and Filtering

UNIT–IV REST API USING JAVA CLIENT JAX-RS

The Param Annotation; Sending Status codes and location Headers; Handling Exception; Using Web-Application Exception; Content Negotiation and Content Negotiation using HTTP Headers; Content Negotiation using URIs Patterns

JAX-RS Client; Creating JAVA Client using JAX-RS; Sending GET/POST Request using JAVA Client.

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BTIBMC701	**DCC**	**Web Services**	**60**	**20**	**20**	**0**	**50**	**3**	**0**	**2**	**4**

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UNIT–V WRITING SOAP SERVICES

Initialize a Spring Web Service Application with Spring Boot; Overview of creating SOAP Web Service using Contract First Approach; Define Request and Response XML Structure; Define XSD for Request and Response; Introduction to JAXB and configuration. What are Secure Web Services? Transport Level Security and Application-Level Security. Future of Web Development; Future of SOAP WSDL and UDDI.

PROJECT

Create and execute a SOAP project using WSDL. Following should be done on the project:

I. Creating SOAP project- adding WSDL during creation or after it is created.
II. Request and Response verification.

TEXT BOOKS:

1. IBM Courseware
2. IBM Knowledge Center
3. RESTful Web Services by Leonard Richardson O'Reilly Media

REFERENCES:

1. Core Java, Collection Framework IBM Knowledge Center.