



B.Sc. (Information Technology)
(Semester-VII) (Without Research)

Course Code	US07HMABIT01	Title of the Course	Fundamentals of Machine Learning
Total Credits Of the Course	4	Hours per Week	4

Course Objectives:	1. To understand the fundamental concepts and terminology of Machine Learning, including types of learning such as supervised, unsupervised, and reinforcement learning. 2. To study various machine learning algorithms and models, including regression, classification, clustering, and decision trees. 3. To develop the ability to preprocess and analyze data using techniques such as data cleaning, feature selection, and normalization for effective machine learning model building. 4. To apply machine learning techniques to solve real-world problems using appropriate tools and programming languages. 5. To evaluate and interpret the performance of machine learning models using different evaluation metrics and validation techniques.
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Course Content		
Unit	Description	Weightage (%)
1.	Introduction to Machine Learning • What is Human Learning • What is Machine Learning • Human Learning vs Machine Learning • Types of Machine Learning • Applications of Machine Learning • Basic Types of Data in Machine Learning	25
2.	Data Preparation, Modelling, Training and Evaluation • Machine Learning Activities • Data Quality and Remediation • Data Pre-Processing Techniques • Selecting a Model • Training a Model • Model Representation and Interpretability • Evaluating the Performance of a Model	25





3.	Supervised Learning (Classification and Regression) • Example of Supervised Learning • Classification Models • Steps in Classification Learning • Common Classification Algorithms(KNN, Decision Tree, Random Forest) • Regression Concepts • Common Regression Algorithms(Simple Linear, Multiple Linear Regression Algorithm)	25
4.	Unsupervised Learning • Introduction to Unsupervised Learning • Applications of Unsupervised Learning • Clustering Techniques • Finding Patterns using Association Rules	25

Teaching- Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination Internal Continuous Assessment in the form of Quizzes, Seminars, Assignments, Attendance	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand fundamental concepts of machine learning, types of learning, and their real-world applications.
2.	analyze different data preparation techniques, including data preprocessing and feature engineering for machine learning models.
3.	apply appropriate machine learning algorithms such as classification and regression techniques to solve computational problems.
4.	evaluate the performance of machine learning models using suitable evaluation and model improvement techniques.
5.	develop solutions for real-world problems using supervised and unsupervised learning techniques such as clustering and association rule mining.





SARDARPATELUNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC(CGPA3.11))
Syllabus with effect from the Academic Year 2025-2026

Suggested References:

Sr.No.	References
1.	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, Pearson Education, 2019.
2.	Tom M Mitchell, Machine Learning, McGraw Hill, 1997.
3.	Anuradha Srinivasaraghavan, Vincy Joseph, Machine Learning, Wiley India, 2018.
4.	U. Dinesh Kumar, Manaranjan Pradhan, <i>Machine Learning using Python</i> , Wiley India, 1st Edition, 2019.

On-line resources to be used if available as reference material

On-line Resources

1. https://www.tutorialspoint.com/machine_learning/index.htm
2. https://www.w3schools.com/python/python_ml_getting_started.asp
3. <https://www.geeksforgeeks.org/machine-learning/machine-learning/>





B.Sc. (Information Technology)
(Semester-VII) (Without Research)

Course Code	US07HMABIT02	Title of the Course	Full Stack Web Application Development
Total Credits Of the Course	4	Hours per Week	4

Course Objectives:	1. To understand the fundamental concepts of web development and identify the roles of client-side and server-side technologies. 2. To explain and apply HTML5, CSS, and JavaScript concepts for developing structured and interactive web pages. 3. To analyze the working of web clients, web servers, and the HTTP protocol used for client-server communication. 4. To develop basic server-side applications using Node.js and Express framework. 5. To examine and implement database operations using MongoDB and integrate it with Node.js applications. 6. To design and build simple user interfaces using React.js functional components and props for modern web applications.
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Course Content		
Unit	Description	Weightage (%)
1.	Basics of Web Development • Overview of web development: Client-side vs Server-side • HTML5 : Semantic elements, forms • CSS : Syntax, Inline CSS, Internal CSS, External CSS, CSS Flexbox • JavaScript: Introduction, Data Types, Variables, Functions, • ES6 Basics: let & const, Arrow functions, • Event Handling	25
2	Introduction to Web Server & Node.js • Web Client and Web Server : Overview, Functionalities • HTTP Protocol : Overview, Features, • Client-Server communication using HTTP • Overview of Node.js and its features • Node.js core modules : HTTP module (http), File System Module (fs) • Express framework : Introduction, advantages, Creating a basic Express server • Routing in Express: GET, POST • Serving static files in Express	25





3.	Database Management • SQL vs NoSQL databases • MongoDB: Overview, Advantages, Working • Basic querying with MongoDB shell • Connecting MongoDB with Node.js using Mongoose • CRUD operations	25
4.	Fundamentals of React.js • React.js: Introduction, Advantages, Features • Overview of JSX and ReactDOM • Functional Components • Properties (props)	25

Teaching- Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination Internal Continuous Assessment in the form of Quizzes, Seminars, Assignments, Attendance	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand fundamental concepts of web development including HTML5, CSS, JavaScript, and ES6 features.
2.	analyze the working of web clients, web servers, and the HTTP protocol used in client-server communication.
3.	develop and implement basic server-side applications using Node.js and Express framework, including routing and static file handling.
4.	apply and perform database operations using MongoDB and integrate MongoDB with Node.js using Mongoose.
5.	design and build basic user interface components using React.js functional components and props.
6.	create and demonstrate a simple full-stack web application integrating frontend, backend, and database technologies.





Suggested References:

Sr.No.	References
1.	HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), DT Editorial Services, Dreamtech Press, 2nd Edition, 2016.
2.	Aazat Mardan, Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB, Apress Publications, 2nd edition, 2018.
3.	Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress Publications, 1st Edition, 2018.
4.	Vasan Subramanian, Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node, Apress, 2019.
5.	Shyam Seshadri, <i>Full Stack Web Development with React and Node</i> , BPB Publications, 1st Edition, 2021.
6.	Sandeep Panda, <i>React.js: Building Modern Web Applications</i> , BPB Publications India, 2020.

On-line resources to be used if available as reference material

On-line Resources

1. <https://www.w3schools.com/>
2. <https://nodejs.org/en/docs>
3. <https://expressjs.com/>
4. <https://react.dev/learn>
5. <https://www.mongodb.com/docs/>





B.Sc. (Information Technology)
(Semester-VII) (Without Research)

Course Code	US07HMABIT03	Title of the Course	Practical based on US07HMABIT01 and US07HMABIT02
Total Credits Of the Course	4	Hours per Week	8

Course Objectives:	1. To develop practical skills in data preprocessing, visualization, and implementation of basic Machine Learning algorithms using suitable programming tools. 2. To apply supervised and unsupervised learning techniques and evaluate machine learning models for solving real-world problems. 3. To design and develop interactive web pages using HTML, CSS, JavaScript, and modern web development concepts. 4. To implement server-side applications using Node.js and Express and perform database operations using MongoDB. 5. To build simple full-stack web applications by integrating front-end, back-end, and database technologies.
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Course Content		
Unit	Description	Weightage (%)
1.	Practical based on Programming Fundamental Using Machine Learning	50
2	Practical based on Programming Fundamental Using Node.js and React	50

Teaching- Learning Methodology	Practical-based learning in small groups and Hands-on training through required ICT tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination Internal Continuous Assessment in the form of Practical, Viva-voce, Attendance	50%
2.	University Examination	50%





Course Outcomes: Having completed this course, the learner will be able to	
1.	apply data preprocessing techniques and implement basic Machine Learning algorithms using appropriate programming tools.
2.	analyze datasets and evaluate machine learning models using suitable performance metrics.
3.	develop interactive web applications using HTML, CSS, JavaScript, and modern frameworks.
4.	implement and integrate server-side applications and databases using technologies such as Node.js, Express, and MongoDB to build simple full-stack applications





B.Sc. (Information Technology)
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Course Code	US07HMIBIT04	Title of the Course	IoT Fundamentals
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	1. To introduce the fundamental concepts of Internet of Things (IoT) and its application areas in modern technology. 2. To develop understanding of IoT architecture, stack layers, and operational levels used in IoT systems. 3. To explain the concept of “Things” in IoT and how devices communicate within IoT networks. 4. To familiarize students with different sensors used in IoT systems such as light, ultrasonic, gas, temperature, humidity, PIR, GPS, heartbeat, and pH sensors. 5. To enable students to understand interfacing techniques between sensors and microcontrollers using Arduino IDE
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Course Content		
Unit	Description	Weightage (%)
1	Basics of IoT • Application Areas of IoT • Characteristics of IoT • Concept of “Things” in IoT • IoT Stack and its Layers • IoT Challenges • IoT Levels • IoT Architecture	50
2.	IoT Components and Interfacing • Introduction to Sensors • Types of Sensors in IoT: Light sensor, Ultrasonic sensor, Gas sensor, Temperature and Humidity sensor, PIR motion sensor, GPS sensor, heartbeat sensor, Ph Sensor • Basics of Microcontroller • Arduino Overview: Architecture, Components, Arduino IDE, Program Structure (setup() and loop() functions)	50





Teaching-Learning Methodology	Blended learning approach incorporating traditional classroom teaching and online /ICT-based teaching practices.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination Internal Continuous Assessment in the form of Quizzes, Seminars, Assignments, Attendance	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to

1.	explain the fundamental concepts, characteristics, and application areas of IoT.
2.	describe IoT architecture, IoT stack layers, and different IoT operational levels
3.	identify and differentiate various sensors used in IoT applications
4.	understand the working principles of microcontrollers and Arduino architecture.
5.	develop basic IoT programs using Arduino IDE and implement simple sensor interfacing.

Suggested References:

Sr.No.	References
1.	Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, Hyderabad, 2015.
2.	Raj Kamal, Internet of Things: Architecture and Design Principles, McGraw Hill Education (India) Pvt. Ltd., 2017.
3	Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley Publications, 2012.
4	Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, John Wiley & Sons, 2015.
5	Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6, Wiley Publications, 2013.
6.	Sudip Misra, Anandarup Mukherjee, Arijit Roy, <i>Introduction to Internet of Things: A Practical Approach</i> , Cambridge University Press India, 2021.





On-line resources to be used if available as reference material

On-line Resources

1. <https://www.geeksforgeeks.org/internet-of-things-iot/>
2. https://www.tutorialspoint.com/internet_of_things/index.htm
3. <https://www.ibm.com/topics/internet-of-things>





B.Sc. (Information Technology)
(Semester-VII) (Without Research)

Course Code	US07HMIBIT05	Title of the Course	Practical based on US07HMIBIT04
Total Credits Of the Course	2	Hours per Week	4

Course Objectives:	1. To develop practical understanding of Internet of Things (IoT) concepts, architecture, and components. 2. To provide hands-on experience with sensors and microcontrollers used in IoT systems. 3. To implement sensor interfacing and data acquisition using Arduino and related development tools. 4. To design simple IoT-based applications for monitoring and automation using different sensors.
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Course Content		
Unit	Description	Weightage (%)
1.	Practical based on Programming Fundamentals of IoT.	100

Teaching- Learning Methodology	Practical based learning in small groups and Hands on training through required ICT tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination Internal Continuous Assessment in the form of Practical, Viva-voce, Attendance	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	explain the working of IoT components such as sensors, microcontrollers, and communication modules.
2.	interface different sensors with Arduino and acquire data using appropriate programming techniques.
3.	develop simple IoT-based applications for monitoring and automation.





B.Sc. (Information Technology)
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Course Code	US07HSEBIT06	Title of the Course	On Job Training
Total Credits of the Course	6	Hours per Week	12

Course Objectives:	To enhance employability through industry exposure.
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Course Content		
	Description	Weightage (%)
	Practical experience in an industry by applying theoretical knowledge to real-world tasks and projects.	100

Teaching-Learning Methodology	Project-based learning and hands-on training through required ICT tools.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Project Examination Internal Continuous Assessment in the form of Practical, Viva-voce, Attendance	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Technical proficiency (e.g., coding, networking), Problem-solving, Teamwork, Professional ethics etc.

