B.Tech Mechanical Engineering (Specialization in Artificial Intelligence and Machine Learning)
Four Year Program
Academic Curriculum (2025-2029 Batch Onwards)

Curriculum Components

Component	Credits	Courses	
1. University Core (3 Courses)	06	UC 23.101 Human Values & Professional Ethics UC 23.102 Pragmatic English Communication UC 25.201 Management and Entrepreneurship	
2. University Elective (2 Courses)	06	Mody University Elective I Mody University Elective II	
3. Basic Science (10 Courses)	29	MA 23.101 Mathematics I CY 23.101 Engineering Chemistry CY 23.111 Chemistry Laboratory CY 23.102 Environmental Sciences MA 23.102 Mathematics II PY 23.101 Engineering Physics PY 23.111 Physics Laboratory MA 23.201 Mathematics-III ME 23.205 Material Science ME 23.308 Optimization Techniques	
4. Engineering Science (09 Courses)	19	ME 25.101 Applied Mechanics EC 25.101 Basics of Electronics Engineering EC 23.111 Electronics Laboratory ME 23.111 Computer Aided Engineering Drawing EE 25.101 Basics of Electrical Engineering EE 23.111 Electrical Laboratory CS 23.101 Programming for Problem Solving CS 23.111 Programming Laboratory ME 23.112 Mechanical Workshop	
5. Program Core (29 Courses)	65	ME 25.207 Basics of Sensors and Processing Techniques ME 23.201 Mechanics of Solids ME 23.203 Engineering Thermodynamics ME 23.215 Mechanics of Solids Laboratory ME 23.217 Thermodynamics Laboratory ME 23.219 Computer Aided Machine Drawing ME 23.202 Kinematics of Machines ME 23.204 Fluid Mechanics ME 23.206 Design of Machine Elements I ME 23.208 Production Technology I ME 23.216 Fluid Mechanics Lab ME 23.218 Design of Machine Elements Practice I ME 23.220 Production Laboratory ME 23.301 Dynamics of Machines ME 23.303 Fluid Machinery ME 23.305 I C Engines	ME 23.307 Production Technology II ME 23.317 Fluid Machinery Lab ME 23.319 IC Engine Laboratory ME 23.304 Refrigeration and Air Conditioning ME 23.306 Advanced Production Technology ME 23.310 Design of Machine Elements II ME 19.312 CAD/CAM ME 23.320 Design of Machine Elements Practice II ME 23.322 Advanced Production Technology Lab CS 23.203 Data Structure CS 23.253 Data Structure Laboratory CS 23.303 Operating System CS 23.393 Artificial Intelligence & Machine Learning
6. Program Elective / MOOCs (5 Courses)	15	MOOC – 01 Program Elective – 04	
7. Project / Summer Internship Project/Colloquium (11 Courses)	21	Project Based Learning (PBL)-04 Summer Internship Project – 02 Colloquium – 01 Project – 02 Capstone Project – 02	
8. Proficiency (Non-Credit / Non-Graded) (6 Courses)	00	SEFS – 06	
Total	**161**	**75 Courses**	

B.Tech Mechanical Engineering (Specialization in Artificial Intelligence and Machine Learning)
Four Year Program
Academic Curriculum (2025-2029 Batch Onwards)

First Year - Autumn Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
UC 23.101	Human Values & Professional Ethics	2	0	0	2	3	10	40	50
MA 23.101	Mathematics I	3	1	0	4	3	10	40	50
CY 23.101	Engineering Chemistry	3	0	0	3	3	10	40	50
ME 25.101	Applied Mechanics	3	0	0	3	3	10	40	50
EC 25.101	Basics of Electronics Engineering	3	0	0	3	3	10	40	50
CY 23.102	Environmental Sciences	2	0	0	2	3	10	40	50
ME 23.111	Computer Aided Engineering Drawing	0	0	4	2	2	50		50
CY 23.111	Chemistry Laboratory	0	0	2	1	2	50		50
EC 23.111	Electronics Laboratory	0	0	2	1	2	50		50
PB 25.101	Project Based Learning	0	0	2	1		50		50
SF 101	Personal Grooming and Fine Dinning (Non Grade)	0	0	2	1	2	50		50
	Total	16	1	12	**22**				

First Year –Spring Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
UC 23.102	Pragmatic English Communication	2	0	0	2	3	10	40	50
MA 23.102	Mathematics II	3	1	0	4	3	10	40	50
PY 23.101	Engineering Physics	3	0	0	3	3	10	40	50
EE 25.101	Basics of Electrical Engineering	3	0	0	3	3	10	40	50
CS 23.101	Programming for Problem Solving	3	0	0	3	3	10	40	50
PY 23.111	Physics Laboratory	0	0	2	1	2	50		50
EE 23.111	Electrical Laboratory	0	0	2	1	2	50		50
CS 23.111	Programming Laboratory	0	0	4	2	2	50		50
ME 23.112	Mechanical Workshop	0	0	2	1	2	50		50
SF 102	Social Grooming, Home & Décor and Business Communication (Non Grade)	0	0	2	1	2	50		50
PB 25.102	Project Based Learning	0	0	2	1		50		50
	Total	14	1	14	**21**				

Second Year – Autumn Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
ME 25.207	Basics of Sensors and Processing Techniques	2	0	0	2	3	10	40	50
MA 23.201	Mathematics-III	3	1	0	4	3	10	40	50
CS 23.203	Data Structure	3	0	0	3	3	10	40	50
ME 23.201	Mechanics of Solids	3	0	0	3	3	10	40	50
ME 23.203	Engineering Thermodynamics	3	0	0	3	3	10	40	50
ME 23.205	Material Science	3	0	0	3	3	10	40	50
ME 23.215	Mechanics of Solids Laboratory	0	0	2	1	2	50		40
ME 23.217	Thermodynamics Laboratory	0	0	2	1	2	50		40
CS 23.253	Data Structure Laboratory	0	0	2	1	2	50		40
ME 23.219	Computer Aided Machine Drawing	0	0	2	1	2	50		50
PB 25.201	Project Based Learning	0	0	2	1		50		50
SF 201	Personal Grooming Fine Dining and Home Safety (Non Grade)	0	0	2	1	2	50		50
	Total	17	1	12	**23**				

Second Year –Spring Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
UC 25.201	Management and Entrepreneurship	2	0	0	2	3	10	40	50
UE	University Elective-I	3	0	0	3	3	10	40	50
ME 23.202	Kinematics of Machines	3	0	0	3	3	10	40	50
ME 23.204	Fluid Mechanics	3	0	0	3	3	10	40	50
ME 23.206	Design of Machine Elements I	4	0	0	4	3	10	40	50
ME 23.208	Production Technology I	3	0	0	3	3	10	40	50
ME 23.216	Fluid Mechanics Lab	0	0	2	1	2	50		50
ME 23.218	Design of Machine Elements Practice I	0	0	2	1	2	50		50
ME 23.220	Production Laboratory	0	0	2	1	2	50		50
PB 25.202	Project Based Learning	0	0	2	1		50		50
SF 202	Social Grooming and Professional Skills (Non Grade)	0	0	2	1		50		50
		18		10	**22**				

Third Year – Autumn Semester										
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage			
		L	T	P			CW	MTE	ETE	
ME 23.301	Dynamics of Machines	3	0	0	3	3	10	40	50	
ME 23.303	Fluid Machinery	3	0	0	3	3	10	40	50	
ME 23.305	I C Engines	3	0	0	3	3	10	40	50	
ME 23.307	Production Technology II	3	0	0	3	3	10	40	50	
CS 23.303	Operating System	3	0	0	3	3	10	40	50	
ME 23.317	Fluid Machinery Lab	0	0	2	1	2	50		50	
ME 23.319	IC Engine Laboratory	0	0	2	1	2	50		50	
	Program Elective-1*	0	0	0	3		Based on MOOC Exam Score			
ME 23.323	Summer Internship – I**	0	0	0	2		50		50	
ME 23.325	Project I	0	0	4	2		50		50	
GE 25.301	Proficiency (Non Credit Non Grade)	0	0	0	1		100			
	Total	15		10	**24**					

Third Year -Spring Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
CS 23.393	Artificial Intelligence & Machine Learning	3	0	0	3	3	10	40	50
ME 23.304	Refrigeration and Air Conditioning	3	0	0	3	3	10	40	50
ME 23.306	Advanced Production Technology	3	0	0	3	3	10	40	50
ME 23.308	Optimization Techniques	3	1	0	4	3	10	40	
ME 23.310	Design of Machine Elements II	3	0	0	3	3	10	40	50
ME 23.312	CAD/CAM	3	0	0	3	3	10	40	50
ME 23.320	Design of Machine Elements Practice II	0	0	2	1	2	50		50
ME 23.322	Advanced Production Technology Lab	0	0	2	1	2	50		50
ME 23.326	Colloquium	0	0	2	1		100		
ME 23.328	Project II	0	0	4	2		50		50
GE 25.302	Proficiency (Non Credit Non Grade)	0	0	0	1		100		
	Total	18	1	12	**24**				

*

The course may be taken through MOOC. NPTEL/SWAYAM/COURSERA will be the authorized platform for these MOOC courses. Minimum 8 weeks course is required for a 3 credit. After successful completion of this MOOC course the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through HOD/NPTEL coordinator. The Course code of MOOC courses will be same as the course code given in NPTEL Certificate.

** Summer Internship-I must be performed in an Industry between summer vacation of end of Second Year and start of Third Year.

Proficiency (Non-Credit/Non Grade) shall be measured through level of participation in skill development programs i.e., sports, Yoga, Life skills, Music, Fine Arts or decided by Departmental academic Committee

Fourth Year - Autumn Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
UE	University Elective-II	3	0	0	3	3	10	40	50
	Program Elective-2	3	0	0	3	3	10	40	50
	Program Elective-3	3	0	0	3	3	10	40	50
ME 23.421	Summer Internship -II***	0	0	0	2		100		
ME 23.423	Capstone Project-I	0	0	4	2		100		
	Total	9		4	**13**				

Fourth Year -Spring Semester									
Course Code	Course Title	Contact Hours Per Week			Credits	ETE Duration (Hours)	Weightage		
		L	T	P			CW	MTE	ETE
	Program elective-4	3	0	0	3	3	10	40	50
	Program elective-5	3	0	0	3	3	10	40	50
ME 23.422	Capstone Project-II	0	0	0	6		100		
	Total	6			**12**				

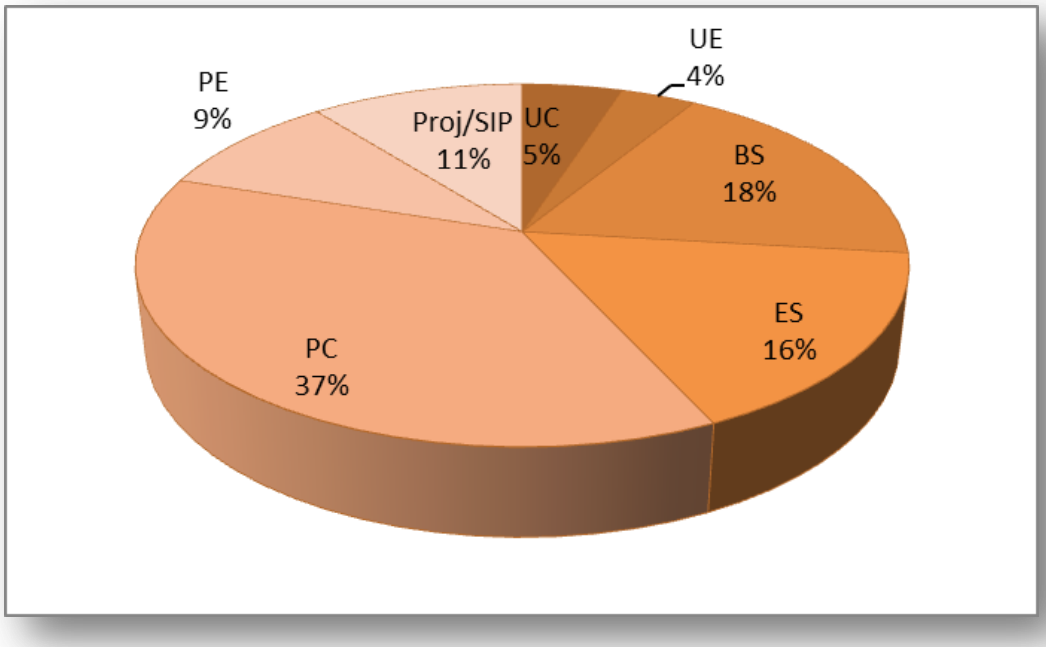
*** Summer Internship-II must be performed in an Industry between summer vacation of end of Third Year and start of Fourth Year.

List of Program Elective Options

Code	PROGRAM ELECTIVE
PROGRAM ELECTIVE- 1	
CS 23.205	General Purpose Programming
	Python programming (NPTEL)
PROGRAM ELECTIVE-2	
CS 23.484	Big Data Analytics
ME 23.417	Flexible Manufacturing Systems
PROGRAM ELECTIVE- 3	
ME 23.407	Work System Design
ME 23.409	Machine Tool Design
PROGRAM ELECTIVE- 4	
CS 23.493	Foundation and Application of IoT
CS 23.308	Digital Image Processing
PROGRAM ELECTIVE- 5	
ME 23.414	Automation and System Integration in Manufacturing
ME 23.408	Product Design and Development

Credit Distribution across all Components								
Semester	UC	UE	BS	ES	PC	PE	Proj/SIP	Total
First	2	0	10	9	0	0	1	22
Second	2	0	8	10	0	0	1	21
Third	0	0	7	0	15	0	1	23
Fourth	2	3	0	0	16	0	1	22
Fifth	0	0	0	0	17	3	4	24
Sixth	0	0	4	0	17	0	3	24
Seventh	0	3	0	0	0	6	4	13
Eighth	0	0	0	0	0	6	6	12
Total	6	6	29	19	65	15	21	161

UC	University Core
UE	University Elective
BS	Basic Science
ES	Engineering Science
PC	Program Core
PE	Program Elective / MOOC
Proj/SIP	Project/Summer Internship



CS-23.203 **Data Structures** **Total Lectures: 40**
Credit:3-0-0-3

Prerequisite(s): CS 23.101 (Programming for Problem Solving-I)

Objective(s):

- To provide knowledge of ways of structuring and operating on data ,the nature of some fundamental problems ,methods for addressing those problems, and to promote an analytical and empirical appreciation of the behavior of algorithms using data structures

1. **Introduction:** Basic terminology, elementary data organization, algorithm, efficiency of an algorithm, time and space complexity, asymptoticnotations, time-space trade-off, abstract datatypes. [4]
2. **Array & Linked list:** Definition, single and multidimensional arrays, representation of arrays: row major order, and column major order, application of arrays, sparse matrices and their representations. Singly linked lists, doubly linked list, circular linked list, insertion, deletion, traversal, polynomial representation and addition, generalized linked list. [10]
3. **Searching & Sorting:** Sequential search, binary search, comparison and analysis, hash function, collision resolution strategies, insertion sort, selection sort, bubble sort, quick sort, merge sort, heap sort, radix sort. [10]
4. **Stack& Queue:** Primitive stack operations: push and pop array and linked list implementation of stack, application of stack: prefix and post fix expressions, evaluation of postfix expression, recursion, and tower of Hanoi problem. Queue operations, circular queues, array and linked list implementation of queues, de queue and priority queue. [8]
5. **Tree:** Binary trees, binary tree representation, tree traversal algorithms: in order, preorder and post order, threaded binary trees, Huffman algorithm, binary search trees AVL trees. [8]

Outcome(s): On the successful completion of the course, the student will be able to:

- Be knowledgeable of certain abstract data types (ADT)
- be able to make a critical assessment of different implementations of an ADT
- be familiar with a number off un damental computational problems, and be aware of real world instances of those problems

Text Books:

1.Lipschutz, "DataStructures"Schaum'sOutlineSeries, TMH, Revised Edition Feb. 2014

2. Horowitzand Sahani, Fundamentals of DataStructures, University Press,2nd Edition, 2008.

Reference Books:

1.AaronM.Tenenbaum,YedidyahLangsamandMosheJ.Augenstein,DataStructures UsingC and C++, PHI, 2nd Edition, 2012.

2. D. Samanta, Classic Data Structures, PHI, 2nd Edition, 2009

3. JeanPaulTrembleyandPaulG.Sorenson,AnIntroductiontoDataStructures withapplications, McGraw Hill, 2nd Edition, 2003.

CS-23.253 **Data Structures Laboratory** **Total Hours:26**
Credit:0-0-2-1

Prerequisite(s): **(** CS 23.111)Programming Laboratory-I

Objective(s):

- To develop skills to design and analyze simple linear and nonlinear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

Contents:

- Implement various operations on arrays
- Implement different operations on different types of link list
- Implement various searching algorithms
- Implement different sorting algorithm and realize their complexities
- Implement Queue and stacks with all the operations
- Implement Binary Tree
- Implement graphs

Outcome(s): At the end of this course, the student will

- Be able to design and analyze the time and space efficiency of the data structure.
- Be capable to identity the appropriate data structure for given problem.
- Have practical knowledge on the application of data structures.

CS-23.303 **Operating System** **Total Lectures: 40**
Credit: 3-0-0-3

Prerequisite(s): CS 23.208 (Computer Organization & Architecture)

Objective(s):

- Understand the fundamental operating system abstractions like processes, threads, files, semaphores, IPC and deadlocks.
- Understand operating system from user's perspective as well as from system's perspective.
- Understand the principles of concurrency and synchronization.
- Understand basic resource management techniques.

1. **Overview:** Definition, types of operating systems, functions of operating system factors effecting the effectiveness of operating system, multi processor, real-time, embedded, system calls and utilities, types of system calls, batch, multiprogramming and multitasking operating system, Interrupts and its mechanism [5]
2. **Process Management:** Process concepts, process state diagram, Process control block, threads, scheduling concepts, types of schedulers, scheduling algorithms, comparison of various CPU scheduling algorithms, multi-level queue scheduling, Inter process communication [8]
3. **Process Synchronization and deadlock:** Independent and concurrent processes, shared memory approach and message passing approach, mutual exclusion, synchronization, inter process communication, critical section problem and its solution to semaphores: binary and counting semaphores, wait/signal operations and their implementation, classical problems of synchronization, deadlock. [11]
4. **Memory Management:** Logical and physical address spaces, base, limit and relocation registers, address binding, dynamic loading and linking, partitioning, swapping, contiguous memory allocation, non-contiguous memory allocation: segmentation, paging and segmentation, Page fault, process to handle page fault, Page replacement algorithms [8]
5. **File Systems:** File concept, user and system programmer view of file systems, different modules of a file system, disk structure, disk-space allocation methods: contiguous, linked, indexed directory structures, file protection, disk scheduling algorithms. [8]

Outcome(s): ı successful completion of this course, students will be able to

- Analyze the primary functionalities of operating system.
- Manage system resources efficiently as an operating system designer.
- Develop new operating systems as well as work on existing ones to develop them further.

Text Books:

1. Galvin, Silberschatz, Gagne, Operating System Concepts, Wiley India, 9th edition, 2015.
2. Stallings, Operating Systems: Internals and Design Principles, Pearson education, 7thedition 2013.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems - Prentice-Hall, Inc., 4th edition, 2015.
2. Deitel, Operating Systems, Pearson Education , 3rd edition, (2012 reprint).

CS 23.393 **Artificial Intelligence and Machine Learning** **Total Lectures: 40**
Credit: 3-0-0-3

Prerequisite(s): (Programming Language), (Logic in Computer Science)

Objective(s):

- To understand the basic problem solving in Artificial Intelligence.
- To learn different blind as well as heuristic search strategies.
- To understand the various ways of knowledge representation in Artificial Intelligence.
- To know the concepts of machine learning.

1. **Overview of Artificial Intelligence:** Introduction to artificial intelligence and intelligent agents, brief history of artificial intelligence, related research fields, AI techniques, AI problems, applications and future of AI. [6]

2. **Problem Solving and Search Techniques:** Basics of problem solving, Problem representation paradigms, defining problem as a state space representation, uninformed search, depth first search, breadth first search, heuristic search, heuristic functions, generate and test, hill climbing, best first search, A* algorithm, problem reduction, AND/OR graph, AO* algorithm. [8]

3. **Knowledge Representation and Logic:** Representation and mappings, procedural versus declarative knowledge, approaches and issues in knowledge representation, first order logic, higher order logic, unification and resolution for performing logical inference, probabilistic logic. [8]

4. **Game Theory:** Minimax search, alpha-beta cutoffs, iterative deepening, references on specific games. [8]

5. **Machine Learning:** Components of learning, supervised learning, unsupervised learning, reinforcement learning, perceptron learning, support vector machines, KNN, learning decision trees, association rule mining, applications in game playing and robot control. [10]

Outcome(s): On successful completion of this course, students will be able to

- Solve the basic problems and apply searching techniques used in Artificial Intelligence.
- To select knowledge representations to solve AI problems.
- Apply various machine learning techniques.

Text Books:

1. Rich E., and Knight K., Artificial Intelligence, Tata McGraw-Hill, 3rd edition, 2009.
2. P. Flach, Machine Learning: The art and science of algorithms that make sense of data, Cambridge University Press, 2012.

Reference Books:

1. Patterson D. W., Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall of India, 1st edition, 2015.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 5th edition, 2009.
3. Russell S., and Norvig P., Artificial Intelligence – A Modern Approach, Prentice-Hall of India, 3rd edition, 2014.

CS 23.484 **Big Data Analysis** **Total Lectures: 40**
Credit:3-0-0-3

Prerequisite(s): Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment

Objective(s):

- To Understand the Big Data Platform and its Use cases
- To Provide an overview of Apache Hadoop
- To Provide HDFS Concepts and Interfacing with HDFS
- To Understand Map Reduce Jobs
- To Provide hands on Hodoop Eco System
- To Apply analytics on Structured, Unstructured Data.
- To Exposure to Data Analytics with R.

1. INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets. [10]
2. HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. [8]
3. Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. [5]
4. Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS, NoSQL: What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL [10]
5. Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR. [7]

Outcome(s): On the successful completion of the course, the student will be able to:

- Identify Big Data and its Business Implications.
- List the components of Hadoop and Hadoop Eco-System
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Analyze Infosphere BigInsights Big Data Recommendations.
- Apply Machine Learning Techniques using R.

Text Books:

1.Tom White " Hadoop: The Definitive Guide" Third Edit , O'reily Media, 2012.
2.Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.

CS 23.493 **Foundations and Applications of IoT** **Total Lectures: 40**
Credit: 3-0-0-3

Prerequisite(s): CS 23.101 (Programming for Problem Solving), CS 23.303 (Operating System), CS 23.306 (Computer Networks)

Objective(s):
- To introduce the vision and impact of IoT.
- To understand IoT layered architecture and protocols
- To introduce hardware used to implement IoT applications.
- To understand the challenges that must be overcome by IoT technology.

1	**Introduction to Internet of Things:** Overview and Motivations, Evolution of IoT, Characteristics of IoT, IoT Layered Architecture, General Observations, ITU-T Views**,** Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.	[6]
2	**RFID:** Introduction, Principle of RFID, Components of an RFID system **EPC Global Architecture Framework:** EPCIS & ONS, Design issues, Technological challenges, Security challenges, IP for IoT, Web of Things **Wireless Sensor Networks:** History and context, WSN Architecture, the node, Connecting nodes, Networking Nodes, Securing Communication, WSN specific IoT applications, challenges: Security, QoS, Configuration, Various integrationapproaches.	[10]
3	**Machine-to-Machine Communications,** Difference between IoT and M2M, Interoperability in IoT,IoT Open source architecture (OIC)- OIC Architecture &Design principles- IoT Devices and deployment models. **Interfacing with Arduino:** Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino	[8]
4	**Working with Raspberry Pi:**Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Piwith basic peripherals, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi, SDN for IoT, Data Handling and Analytics	[8]
5	**IoT Applications:**IoT applications for industry: Future Factory Concepts, Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring**.**	[8]

Outcome(s): On successful completion of this course, students will be able to
- Understand the vision of IoT from a global context.
- Understand the fundamental of IoT hardware.
- Understand the use of Devices, Gateways and Data Management in IoT.
- Build architecture in IoT.
- Analyze, design and develop parts of IoT solution.

Text Books:
1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2MCommunications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

Reference Books:
1. Parikshit N. Mahalle& Poonam N. Railkar, “Identity Management for Internet of Things”, River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).
2. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
3. Peter Waher, "Learning Internet of Things", Packt Publishing Ltd, 2015.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

5. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
6. Malcolm Frank, Paul Roehrig, Ben Pring,"What to Do When Machines Do Everything”, John Wiley & Sons, 2017