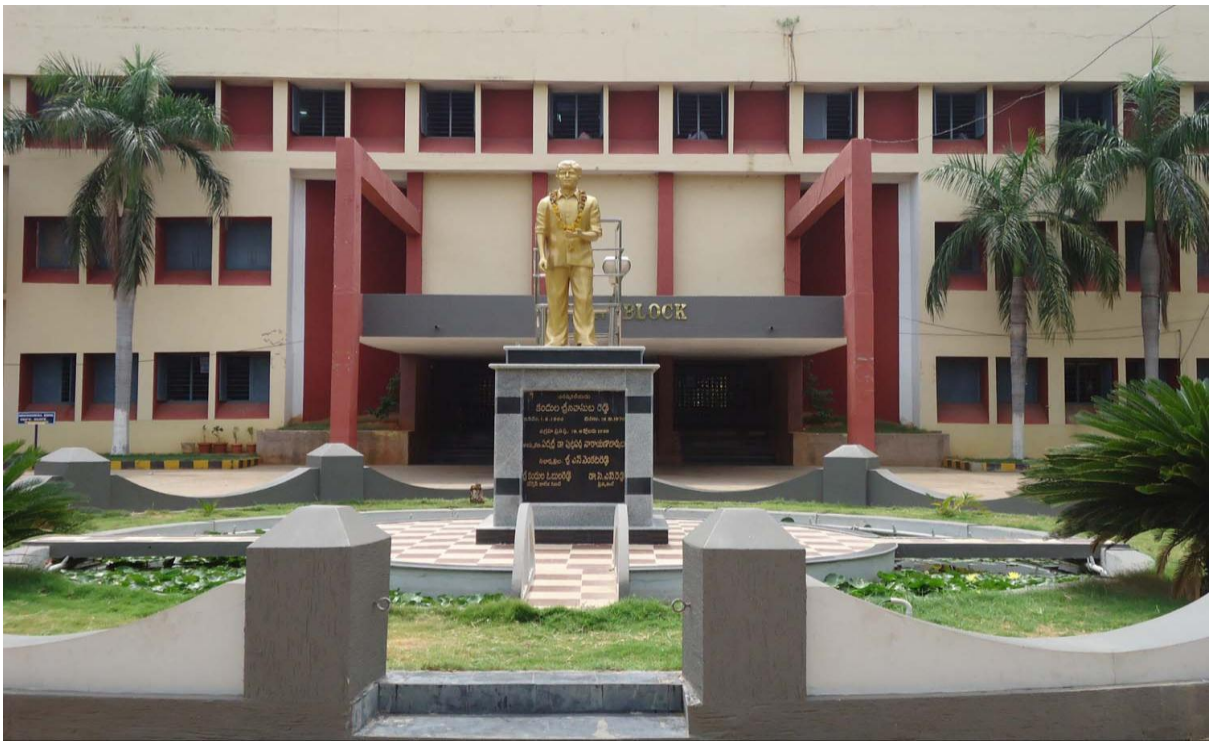
Regulations and Curriculum for Minor Degree and Honours Degree in Computer Science and Engineering (R20 UG-Regulations)



Department of Computer Science and Engineering

Kandula Srinivasa Reddy Memorial College of Engineering
(Autonomous)
Kadapa- 516005
Andhra Pradesh
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

Minor degree in Computer Science and Engineering

Students with higher learning capabilities are encouraged to opt for Minor degree designation. Minor degree imply a higher level of academic achievement and improves employability. A student can earn minor degree designation by meeting the following requirements.

1. Minor degree is optional. A student can opt for either Minor degree or Honours designation but not both.
2. Entry eligibility: Students shall apply for minor degree at the beginning of fifth semester. Eligibility criteria are (i) minimum CGPA of 8.0 for Open Category and 7.5 for SC/ST (ii) No backlogs, reckoned up to third semester.
3. Additional coursework: Students shall complete an additional 20 credits coursework, in addition to 160 regular credits, in selected minor program during fifth to eighth semesters. The Board of Studies (BoS) of the department of Computer Science and Engineering shall specify the list of core/elective subjects for the purpose of minor degree. The core/elective subjects can be studied either by conventional classroom teaching or as online MOOCs on the recommendation of the chairperson of BoS of Computer Science and Engineering department.
4. Continuous performance: Student shall earn a minimum SGPA of 8.0 for Open Category and 7.5 for SC/ST in all semesters, from fifth to eighth, and without backlogs to be eligible for award of minor degree. Regular and additional subjects shall be considered for SGPA calculation. If a student does not get a minimum SGPA of 8.0 for Open Category and 7.5 for SC/ST or fails in any subject during fifth to eighth semesters, he/she will lose candidature for minor degree.

CURRICULUM FOR MINOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

S.No	Subject Code	Subject Name	Semester	L-T-P	Credits
1	2091501	Computer Networks	V Sem	4-0-0	4
2	2091502	Computer Organization	V Sem	4-0-0	4
3	2091503	Mobile Application Development	VI Sem	4-0-0	4
4	2091504	Artificial Intelligence	VI Sem	4-0-0	4
5	2091505	Cryptography & Network Security	VII Sem	MOOC	2
6	2091506	Big Data Technologies	VII Sem	MOOC	2
7	2091507	Internet of Things	VII Sem	MOOC	2
8	2091508	Software Engineering	VII Sem	MOOC	2
9	2091509	Design and Analysis of Algorithms	VII Sem	MOOC	2
10	2091510	Natural Language Processing	VII Sem	MOOC	2

Important Instructions:

1. A total of 6 Subjects must be taken.
2. In the above 6 MOOC subjects, the student can select any two subjects under MOOC/NPTEL, the credits for the MOOC/NPTEL subject is two only.
3. Total Credits required to award Minor degree are 20. The four theory subjects must be completed, each subject carries 4 credits (total 16 credits) and two MOOC/NPTEL carries 4 credits.

Honours degree in Computer Science and Engineering

Students with higher learning capabilities are encouraged to register for Honours degree. Degree with Honours imply a higher level of academic achievement. A student can earn B.Tech degree with honours designation by meeting the following requirements

1. Honours designation is optional one. A student can opt for either Honours designation or Minor degree but not both.
2. Entry eligibility: Students shall apply for Honours designation at the beginning of the fifth semester. Eligibility criteria are (i) minimum CGPA of 8.0 for Open Category and 7.5 for SC/ST (ii) No backlogs, reckoned up to third semester.
3. Additional coursework: Students shall complete an additional 20 credits coursework, in additional to 160 regular credits, in her/his own major during fifth to eighth semesters. The Board of Studies (BoS) of Computer Science and Engineering department shall specify the list of advanced subjects for the purpose of honours designation. The subjects can be studied either by conventional classroom teaching or as online MOOCs on the recommendation of the chairperson of the BoS of Computer Science and Engineering department.
4. Continuous performance: Students shall earn a minimum SGPA of 8.0 for Open Category and 7.5 for SC/ST in all semesters, from fifth to eighth, and without backlogs to be eligible for award of Honours degree. Regular and additional subjects shall be considered for SGPA calculation. If a student does not get a minimum SGPA of 8.0 for Open Category and 7.5 for SC/ST or fails in any subject during fifth to eighth semester, he/She will lose candidature for honours designation.

CURRICULUM FOR HONOURS DEGREE IN COMPUTER SCIENCE AND ENGINEERING

S.No	Subject Code	Subject Name	Semester	L-T-P	Credits
1	2092501	Data Science	V Sem	4-0-0	4
2	2092502	Computer Architecture and organization	V Sem	4-0-0	4
3	2092503	Applied Machine learning in Python	VI Sem	4-0-0	4
4	2092504	Deep Learning	VI Sem	4-0-0	4
5	2092505	Introduction to Block chain Technologies and Applications	VII Sem	MOOC	2
6	2092506	Big Data and Hadoop	VII Sem	MOOC	2
7	2092507	Introduction to Industry 4.0 and Industrial IOT	VII Sem	MOOC	2

Important Instructions:

1. A total of 6 Subjects must be taken.
2. In the above 3 MOOC subjects, the student can select any two subjects under MOOC/NPTEL, the credits for the MOOC/NPTEL subject is two only.
3. Total Credits required to award Honours degree are 20. The four theory subjects must be completed, each subject carries 4 credits (total 16 credits) and two MOOC/NPTEL carries 4 credits.

MINOR DEGREE SYLLABUS

Course Title	COMPUTER NETWORKS				B.Tech CSE- V Sem (Minor Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2091501	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- Study the evolution of computer networks and future direction.
- Study the concepts of computer networks from layered.
- Perspective study the issues open for research in computer networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the terminology and concepts of the OSI reference model and TCP-IP.
CO 2	Describe the functions of Data link layer and its protocols.
CO 3	Classifying the different routing algorithms and IP addressing with network layer
CO 4	Understand connection establishment and services provides by TCP and UDP.
CO 5	Explain the working of DNS and World Wide Web.

UNIT - I

Introduction: Uses of Computer Networks, Network Hardware, Reference Models: OSI, TCP/IP,Comparison of OSI & TCP/IP reference models.

Introduction to physical layer: Data and Signals, Transmission impairment, Datarate limits, Performance.

Transmission media: Introduction, Guided Media, Unguided Media.

Switching: Introduction, Circuit Switched Networks, Packet Switching.

UNIT - II

The Data Link Layer: Data Link Layer design issues, Error Detection and Correction, ElementaryData Link Protocols, Sliding Window Protocols.

The Medium Access Control sublayer : Multiple Access protocols, Ethernet, Data Link LayerSwitching.

UNIT - III

The Network Layer: Network layer design issues, Routing algorithms : The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing,

Congestion control algorithms, Quality of service, IP Addresses, IPv4,IPv6,Tunneling, Fragmentation.

UNIT - IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control,The internet transport protocols: UDP, TCP: Introduction to TCP, Service Model, Protocol, Segment Header, Connection Establishment, Connection Release.

UNIT - V

The Application layer: Domain Name System (DNS), World Wide Web (WWW), E-mail.

Text Books:

1. "Computer Networks", Andrew S. Tanenbaum, David J.Wetherall, Pearson, 5th edition, 2010.

2. "Data communications and networking", Behrouz A. Forouzan, TMH, 5th edition, 2012.

3. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1, Douglas E. Comer, 5th edition, PHI

4. "Computer Networks", 5E, Peterson, Davie, Elsevier.

Reference Books:

1. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.

2. "Computer Networks and Internets with Internet Applications", Comer.

3. Computer Networks, A Top-Down Approach, James F. Kurose, Keith W. Ross, 3rd Edition, Pearson.

4. Computer Networks, A Top-Down Approach, Behrouz A. Forouzan, Firoz Mosharraf, Special Indian Edition, McGraw Hill.

Course Title	COMPUTER ORGANIZATION			B.Tech CSE- V Sem (Minor Degree)			
Course Code	Hours/Week			Credits	Maximum Marks		
2091502	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- To make the students understand the structure of computers and internal organization of different units like memory, I/O devices, registers.
- To study in detail about the microoperationsand implementation of fixed and floating point addition, subtraction, multiplication and division operations.
- To study in detail about pipelining, Memory, I/O organization and multiprocessors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the Basic concepts of computers and Data representation.
CO 2	Understand the concept of Register Transfer and various Micro operations.
CO 3	Understand the concept of basic computer organization and design, Micro programmed control and Computer Arithmetic.
CO 4	Understand the concept of Pipelining and Memory.
CO 5	Understand concept of I/O organization and Multiprocessors.

UNIT-I

Basic Concepts of Computers: Computer Types, Functional units, Basic operational concepts, Bus Structures, Performance. **Data Representation-** Fixed Point Representation, Floating Point Representation.

UNIT-II

Register Transfer and Microoperations: Register Transfer, Bus and memory transfers. Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT-III

Basic Computer Organization and Design: Instruction codes, Computer instructions, Memory Reference Instructions, Input – Output and Interrupt, Addressing modes. **Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Hard wired control, Micro programmed control. **Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms.

UNIT-IV

Pipeline: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.

Memory: Basic concepts, Memory Hierarchy, Cache memory, Performance considerations, Virtual memory.

UNIT-V

Input-Output Organization: Peripheral Devices, Input- Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access (DMA).

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures.

Text Books:

1. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Reference Books:

1. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi, Springer Int. Edition.
2. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course Title	MOBILE APPLICATION DEVELOPMENT				B.Tech CSE-VI Sem (Minor Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2091503	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Min				End Exam Duration: 3Hrs			

Course Objectives:

- To Understand fundamentals of android operating systems.
- To learn the internals of the Android OS
- To learn the Mobile application development using the Android SDK.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the key features of various Mobile Operating Systems.
CO 2	Know essential Android programming concepts
CO 3	Develop Android Applications using GUI components
CO 4	Demonstrate and implement Database connectivity Applications

UNIT I

Android Introduction and Basics: The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge (ADB), Launching Android Applications on a Handset.

UNIT II

Basic Widgets: Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons.

UNIT III

Building Blocks for Android Application Design: Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation.

Utilizing Resources and Media: Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets.

UNIT IV

Using Selection widgets and Debugging: Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Debugging Application, Using the Debug Perspective.

Displaying And Fetching Information Using Dialogs and Fragments: What Are Dialogs?, Selecting the Date and Time in One Application, Fragments, Creating Fragments with java Code, Creating Special Fragments.

UNIT V

Building Menus and Storing Data: Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Tabbed Action Bar, Creating a Drop-Down List Action Bar.

Using Databases: Using the SQLiteOpenHelperclasss, Accessing Databases with the ADB, Creating a Data Entry Form.

Text Books:

1. Android Programming by B.M Harwani, Pearson Education, 2013.
2. Android application Development for Java Programmers, James C Sheusi, Cengage Learning
3. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
4. Beginning Android 4 Application Development, by Wei-Meng Lee , Wiley India.

Reference Text Books:

1. Android Programming for Begineers, John Horton, Packt> Publications.
2. Professional Android 4 Application Development, Reto Meier, Wiley.
3. Android Programming: Big Nerd Ranch Guide, Bill Phillips, Chris Stewart, Pearson

Course Title	ARTIFICIAL INTELLIGENCE				B.Tech CSE-VI Sem (Minor Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2091504	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- To understand how a computer making intelligent decisions.
- To understand the notions of state space representation, heuristic search methods.
- To learn different knowledge representation techniques
- To understand the applications of AI.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Given a search problem, analyze and formalize the problem (as a state space, graph, etc.).
CO 2	The ability defines admissible and consistent heuristics and completeness and optimality.
CO 3	Analyze and Apply knowledge representation technique.
CO4	Ability to understand uncertainty and Design appropriate Bayes Nets corresponding to the causal relationships and conditional independence of a real world situation
CO5	Design good evaluation functions and strategies for game playing and Understand concept of natural language processing.

UNIT-I:

Introduction to AI: AI Problems History what is an AI Technique. Problem, Problem Space and Search, Heuristic Search Techniques.

UNIT-II:

Knowledge Representation Issues, Predicate Logic, Knowledge Representation using rules.

UNIT –III:

Symbolic reasoning under Uncertainty, Bayesian Networks.

UNIT-IV:

Weak Slot Filler Structures, Strong Slot and Filler Structures, Knowledge Representation summary.

UNIT –V:

Game Playing, Planning, Natural Language processing.

Text Books:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.
3. Philip C Jackson, Introduction to Artificial Intelligence: Second, Enlarged Edition.
4. Saroj Kaushik. Artificial Intelligence. Cengage Learning, 2011.

Reference Books:

1. Charu C. Aggarwal,Artificial Intelligence,Springer,2021.
2. Adelyn Zhou, Mariya Yao and Marlene Jia Applied Artificial Intelligence: A Handbook for Business Leaders, 2017
3. Peter Norvig, **Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp.**
4. Dr. Dheeraj Mehrotra,**Basics of Artificial Intelligence & Machine Learning**
5. Chandra S.S.V,**Artificial Intelligence and Machine Learning**
6. Denis Rothman, **Artificial Intelligence by Example**

Course Title	CRYPTOGRAPHY & NETWORK SECURITY		B.Tech CSE-VII Sem (Minor Degree)		
Course Code	Hours/Week	Credits	Maximum Marks		
2091505	MOOC	C	Continuous Internal Assessment	End Exams	Total
		2	40	60	100
Mid Exam Duration: 90 Min		End Exam Duration: 3Hrs			

Course Objectives:

- Extensive, thorough and significant understanding of the concepts, issues, principles and theories of computer network security
- Identifying the suitable points for applying security features for network traffic
- Understanding the various cryptographic algorithms and implementation of the same.
- Understanding the various attacks, security mechanisms and services.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
CO 2	Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.
CO 3	Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
CO 4	Apply different digital signature algorithms to achieve authentication and create secure applications.
CO 5	Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
CO 6	Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security, Classical encryption techniques-symmetric cipher model, substitution ciphers, transposition ciphers, Steganography, Modern Stream ciphers.

UNIT II

Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, Block cipher modes of operations, AES, RC4.

Introduction to Number theory : Integer Arithmetic, Modular Arithmetic,Linear Congruence, Algebraic Structures, GF(2n) Fields, Primes, Factorization, Chinese remainder Theorem, Quadratic Congruence.

UNIT III

Public-key cryptography : Principles of public-key cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, ELGamal cryptographic system.

Cryptographic Hash functions: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).

UNIT IV

Message Authentication Codes: Message authentication Requirements, Message authentication functions, Message authentication codes, security of MACs, HMAC.

Digital Signatures: Digital Signatures, Schnorr Digital Signature Scheme, Digital Signature Standard.

UNIT V

User Authentication: Remote user Authentication Principles, Kerberos

Electronic mail security: Pretty Good Privacy (PGP), S/MIME

Worms, Viruses, Firewalls.

Text Books:

1. Cryptography and network Security by Fourth edition, Stallings, PHI/Pearson
2. Cryptography & Network Security by Behrouz A. Forouzan, TMH.
3. Network Security: The complete reference by Robert Bragg, Mark Rhodes, TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G.T.Gangemi Sr., SPD O'REILLY.

Reference Books:

1. Cryptography and network Security by Atul Kahate, 4th Edition, Tata McGraw Hill.
2. Understanding Cryptography, Christof Paar. Jan Pelzl, Springer.
3. Introduction to Modern Cryptography, Jonathan Katz, Yehuda Lindell, 2nd Edition, CRC Press.

<table>
<tr><td>Course Title</td><td colspan="2">BIG DATA TECHNOLOGIES</td><td colspan="3">B.Tech CSE-VII Sem (Minor Degree)</td></tr>
<tr><td>Course Code</td><td>Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2091506</td><td rowspan="2">MOOC</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="2">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="6">Course Objectives:
• To introduce big data concepts.
• Understanding Hadoob.
• Understanding Big data Applications (HBASE, HIVE).</td></tr>
<tr><td colspan="6">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="5">Demonstrate knowledge in Big Data Characteristics & Hadoop Distributed File System.</td></tr>
<tr><td>CO 2</td><td colspan="5">Analyze large data sets by using Hadoop, Map Reduce, Hive.</td></tr>
<tr><td>CO 3</td><td colspan="5">Design and develop Map Reduce models for data sets.</td></tr>
<tr><td>CO 4</td><td colspan="5">Select Hive and Hive services techniques for effective database models.</td></tr>
<tr><td>CO 5</td><td colspan="5">Contribute towards societal issues and responsibilities in designing, modeling and developing Big Data systems</td></tr>
</table>

UNIT - I

Introduction to Big Data, Why is Big Data, Why Big Data is important, Meet Hadoop, Data, Data Storage and Analysis, Comparison with other systems, Grid Computing, A brief history of Hadoop, Apache Hadoop and the Hadoop EchoSystem, Linux refresher; VMWare Installation of Hadoop.

UNIT - II

The Design of HDFS, HDFS Concepts, Command Line interface to HDFS Hadoop File Systems, Interfaces, Java Interface to Hadoop, Anatomy of a file read, Anatomy of a file write, Replica placement and Coherency Model, Parallel copying with distcp, Keeping an HDFS cluster balanced.

UNIT - III

Introduction, Analyzing data with unix tools, Analyzing data with Hadoop, Java MapReduce classes(new API), Data flow, combiner functions, Running a distributed MapReduce job, Configuration API, Setting up the developing environment, Managing configuration, Writing a unit test with MRUnit, Running a job in local job runner, Running on a cluster, Launching a job, The MapReduce WebUI.

UNIT - IV

Class MapReduce, Job submission, Job initialization, Task Assignment, Task execution, Progress and status updates, Job Completion, Shuffle and sort on Map and Reducer side, Configuration tuning, Map Reduce types, Input formats, Sorting, Map side and Reduce side joins.

UNIT - V

The Hive Shell, Hive services, Hive clients, The meta store, comparison with traditional databases, Hive QI, Hbasics, Concepts, implementation, Java and Map reduce clients, Loading Data, Web queries.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide" , 3rd Edition, O'Reilly Publications,2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Undetstanding Big Data Analytics for Enterprise class Hadoop and Streaming Data", 1st Edition, TMH, 2012.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to DataScience and its Applications, Wiley Publications, 2014.
4. Big Data Technologies and Applications, Borko Furht, Flavio Villanustre, Springer.

Reference Books:

1. Hand Book of Big Data Technologies, Albert Y. Zomaya, Sherif Sakr, Springer.
2. Big Data Analytics: Tools and Technology for Effective Planning, Arun K. Somani, Ganesh Chandra Deka, CRC Press.
3. Big Data, Big Analytics, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley and Sons.

Course Title	INTERNET OF THINGS		B.Tech CSE-VII Sem (Minor Degree)		
Course Code	Hours/Week	Credits	Maximum Marks		
2091507	MOOC	C	Continuous Internal Assessment	End Exams	Total
		2	40	60	100
Mid Exam Duration: 90 Minutes		End Exam Duration: 3Hrs			

Course Objectives:

- Basic principles of IOT.
- Various IOT platforms and application development.
- To know about Arduino board.
- To know about Raspberry pi.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Demonstrate knowledge on Protocols, functional blocks and communicationmodels of Internet of Things.
CO 2	Identify domain specific IoT's.
CO 3	Design appropriate solutions for IoT applications.
CO4	Working with Arduino board.
CO5	Design and develop applications using Raspberry pi device.

UNIT I

INTRODUCTION TO IoT:

Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Development Templates.

UNIT II

DOMAIN SPECIFIC IoTs

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.

UNIT III

IOT and M2M:

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT

IoT Platform Design Methodology:

Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

UNIT IV

Introduction to Arduino:

Introduction, The Arduino Way, The Arduino Platform, Getting started with Arudino, Advanced Input and Output, Sample Programs.

Sensors:

Introduction to sensors, Transducer, Sensors characteristics.

UNIT V

IOT Physical Devices:

What is an IOT device, basic building blocks of an IOT device, Exemplary device: Raspberry Pi, about the board, linux on raspberry Pi, raspberry Pi interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Text Books:

1. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India.
2. Getting Started with Arduino, 3rd Edition, Massimo Banzi and Michael Shiloh
3. Getting Started with Raspberry Pie, Matt Richardson & Shawn Wallace, O'Reilly-2014.
4. ArshdeepBahga, Vijay Madisetti " Internet of Things(A hands on approach)"1STedition, VPI publications,2014.

Reference Books:

1. Raj Kamal, "Internet of Things", McGraw Hill, 1st Edition, 2016.
2. Internet of Things, Surya Durbha, Jyothi Joglekar, Oxford Higher Education.
3. The Internet of Things, Michael Miller, Pearson.
4. The Internet of Things, Samuel Greengard, The MIT Press Ltd

Course Title	SOFTWARE ENGINEERING		B.Tech CSE-VII Sem (Minor Degree)		
Course Code	Hours/Week	Credits	Maximum Marks		
2091508	MOOC	C	Continuous Internal Assessment	End Exams	Total
		2	40	60	100
Mid Exam Duration: 90 Minutes		End Exam Duration: 3Hrs			

Course Objectives:

- Knowledge of basic Software engineering methods and practices, and their appropriate application also the software engineering layered technology and Process frame work.
- A general understanding of software process models such as the waterfall and evolutionarymodels.
- Understanding of the role of project management including planning, scheduling, risk management, etc.
- Understanding of data models, object models, context models and behavioural models alsodifferent software architectural styles.
- Understanding of software testing approaches such as unit testing and integration testingother testing strategies and Risk management.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Ability to apply software engineering principles and techniques.
CO 2	Ability to develop, maintain and evaluate large-scale software systems.
CO 3	To produce efficient, reliable, robust and cost-effective software solutions.
CO 4	To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

UNIT - I

Software and Software Engineering: The Nature of Software, Software Engineering, Software Process Software Myths. Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models.

UNIT - II

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, ElicitingRequirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling: Requirements Analysis, Scenario-Based Modeling, Data Modeling Concepts, Class-Based Modeling.

UNIT - III

Design Concepts: Design within the Context of Software Engineering, Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, ArchitecturalDesign.

UNIT - IV

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Coding and Testing: Testing, Testing in the Large versus Testing in the Small, Unit Testing, Integration Testing, Black-Box Testing, White-Box Testing, Debugging, System Testing.

UNIT - V

Software Project Management: Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO-A Heuristic Estimation Technique, Halstead's Software Science-An Analytical Technique, Risk Management.

Text Books:

1. Software Engineering: A practitioner's Approach, Roger S. Pressman, Seventh Edition, 2010,McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, 4th Edition, 2014, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education.
4. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.

Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
3. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer Internationaledition, 2006.
4. Software Engineering2: Specification of systems and languages, Diner Bjorner, SpringerInternational edition , 2006.
5. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		B.Tech CSE-VII Sem (Minor Degree)		
Course Code	Hours/Week	Credits	Maximum Marks		
2091509	MOOC	C	Continuous Internal Assessment	End Exams	Total
		2	40	60	100
Mid Exam Duration: 90 Minutes		End Exam Duration: 3Hrs			

Course Objectives:

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
- To understand different algorithm design techniques.
- To understand the limitations of Algorithmic power.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Prove the correctness and analyze space and time complexity of an algorithm.
CO 2	Understand different algorithm design strategies.
CO 3	Analyze & Apply standard algorithms.
CO 4	Understand Graph/Tree bases applications and appropriate techniques.
CO 5	Current trends in Non Deterministic concepts.

UNIT-I

Introduction: What is an algorithm? Algorithm Specification, **Performance Analysis**: Space complexity, Time Complexity**. Asymptotic Notations**: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), **Brute Force Method:** Sequential Search, Selection Sort, Bubble Sort.

UNIT-II

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's Matrix multiplication.

Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines. **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm.

UNIT-III

Dynamic Programming: General method, Multistage Graphs, All Pairs Shortest Paths, Single Source Shortest Path, Optimal Binary Search Trees,0/1Knapsack problem, Travelling Sales Person problem .

UNIT-IV

Search and Traversal techniques: Techniques for Binary tree, Technique for Graphs, connected components and spanning tree, Bi connected components.

Backtracking: General method, N-Queens problem, Sum of sub sets problem, Graph coloring, Hamiltonian cycles.

UNIT-V

Branch and Bound: Travelling Sales Person problem, 0/1Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Complete and NP-Hard problems: Basic concepts on-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran,"Fundamentals of Computer Algorithms", Galgotia Publications.
2. Levitin, Anany." Introduction to the design & analysis of algorithms**"** Pearson Education, 2008.
3. Udit Agarwal," Algorithms Design and Analysis",Dhanpath Rai & Co,2017.
4. Sedgewick Robert and Kevin Wayne, "Algorithms" , Pearson Education, Fourth Edition.
5. Parag H.Dave Himanshu B.Dave "Design and Analysis of Algorithms" Pearson Education 2008.

Reference Books:

1. Aho, Hopcroft, Ulman,"the Design and Analysis of Computer Algorithms" Pearson Education, 2000.
2. Steven S.Skiena," The Algorithm Design Mannual", Spingers, Third Edition.
3. R.L.Rivest and C.Stein" Introduction to Algorithms",Second Edition, Pearson Education
4. M.T.Goodrich and R.Tomassia, John Wiley and sons," Algorithm Design: Foundations, Analysis and Internet examples".
5. Sanjoy Dasgupta, Christos H Papadimitriou, Umesh Virkumar Vazirani, "Algorithms" , McGraw-Hill Higher Education,2008

Course Title	NATURAL LANGUAGE PROCESSING		B.Tech CSE-VII Sem (Minor Degree)		
Course Code	Hours/Week	Credits	Maximum Marks		
2091510	MOOC	C	Continuous Internal Assessment	End Exams	Total
		2	40	60	100
Mid Exam Duration: 90 Min		End Exam Duration: 3Hrs			

Course Objectives:

- Understand approaches to syntax and semantics in NLP.
- Understand current methods for statistical approaches to machine translation.
- Understand language modeling.
- Understand machine learning techniques used in NLP.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fundamentals required for Computational Linguistics
CO 2	Understand the concepts of Language design, Text Transformer and their Products
CO 3	Have the clear idea of language specifications using context and free grammars
CO 4	Understand machine learning techniques used in NLP

UNIT I

Introduction to Natural Language Understanding, Syntactic Processing: Grammars and Parsing.

UNIT II

Features and Augmented Grammars, Toward Efficient Parsing, Ambiguity Resolution.

UNIT III

Statistical Methods: Probabilistic Context-Free Grammars, Best-First Parsing.

UNIT IV

Semantic Interpretation: Linking Syntax and Semantics, Ambiguity Resolution, other Strategies for Semantic Interpretation.

UNIT V

Context and World Knowledge: Using World Knowledge, Discourse Structure, Defining a Conversational Agent.

Text Book:

1. Natural Language Understanding – James Allen, Second Edition, Pearson Education.

2. Speech and Language Processing – Daniel Jurafsky, James H.Martin.

3. Foundations of Statistical Natural Language Processing – Christopher Manning, Hinrich Schutze, MIT Press.

4. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

Reference Books:

1. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2013-2014

2. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

3. Introduction to Natural Language Processing,Jacob Eisenstein, MIT Press.

4. Natural Language Processing In Action, Hobson Lane, Cole Howard & Hannes Max Hapke, Manning Publications.

HONOURS DEGREE SYLLABUS

Course Title	DATA SCIENCE				B.Tech CSE - V Sem (Honours Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2092501	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- Introduce R as a programming language
- Introduce the mathematical foundations required for data science
- Introduce the first level data science algorithms
- Introduce a data analytics problem solving framework

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe a flow process for data science problems (Remembering)
CO 2	Classify data science problems into standard typology (Comprehension)
CO 3	Develop R codes for data science solutions (Application)
CO 4	Correlate results to the solution approach followed (Analysis)
CO 5	Assess the solution approach (Evaluation)
CO 6	Construct use cases to validate approach and identify modifications required (Creating)

UNIT-I

R – Programming:

Introduction to R, variables and datatypes In R, data frames, recasting and joining of dataframes, arithmetic, logical and matrix operations in R, functions, control structures, data visualization in R basic graphics.

UNIT-II

Linear Algebra:

Linear algebra for data science, solving linear equations, Linear algebra – distance, hyperplanes and half-spaces, Eigenvalues, Eigenvectors, statistical modeling, random variables and probability mass/density functions, sample statistics, hypotheses testing.

UNIT-III

Optimization:

Optimization for data science, unconstrained multivariate optimization, Gradient Descent learning rule, multivariate optimization with equality constraints, multivariate optimization with inequality constraints. Introduction to data science, solving data analysis problems – a guided thought process.

UNIT-IV

First level data science algorithms:

Predictive modeling, linear regression, model assessment, diagnostics to improve linear model fit, simple linear regression model building, simple linear regression model assessment, multiple linear regression.

UNIT-V

Regression Analysis:

Cross validation, multiple linear regression modeling building and selection, classification, logisitic regression, performance measures, logistic regression implementation in R, K-nearest neighbors, K-nearest neighbors implementation in R, K-means clustering, K-means implementation in R.

Text Books:

1. Introduction to Linear Algebra – by Gilbert Strang
2. Applied Statistics and Probability for Engineers – by Douglas Montgomery
3. R Programming for Data Science – by Roger D. Peng

Web Links:

1. **https://nptel.ac.in/courses/106/106/106106179/**

Course Title	Computer Architecture and Organization				B.Tech CSE - V Sem (Honours Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2092502	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- To make the students to understand the structure of computers and internal organization of different units like memory, I/O devices and registers.
- To Study the basic concepts of computer architecture and organization.
- To study in detail about the operation of control unit and Arithmetic unit

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic concepts of computer architecture and organization
CO 2	Understand the design of the control unit and memory organization
CO 3	Understand the design of Adders, Multipliers and Dividers
CO 4	Understand the basic concepts of pipelining and Vector processor
CO 5	Use of memory and I/O devices effectively and to explore requirements of cache Memory and Multiprocessors

UNIT-I

Basic Computer Organization and Design:

Evolution of Computer Systems, Basic Operation of a Computer, Memory Addressing and Languages, Software and Architecture Types, Instruction Set Architecture, Number Representation, Instruction format and Addressing Modes, CISC and RISC Architecture.

UNIT-II

Control Unit:

Measuring CPU Performance, Design of control unit.

Memory Organization:

Processor memory interaction, Static and Dynamic RAM, Asynchronous DRAM, Synchronous DRAM, Memory interfacing and addressing, Memory hierarchy design, Cache Memory, Improving cache performance.

UNIT-III

Computer Arithmetic:

Design of Adders, Design of Multipliers, Design of Dividers, Floating point numbers, Floating point arithmetic.

Pipelining and Vector Processing:

Parallel processing, Pipelining, Arithmetic pipeline, Instruction Pipeline, Vector Processing.

UNIT-IV

Input – Output Organization:

Secondary storage devices, Input Output Organization, Data transfer techniques, Interrupt handling, Dynamic Memory Access.

UNIT-V

Multiprocessors:

Characteristics of Multiprocessors, Interconnection Structures,Interprocessor Arbitration Inter Processor Communication and synchronization.

TEXT BOOKS:

1. D.A.Patterson and J.L.Hennessy," ComputerArchitecture:AQuantitative approach, 5/E", Morgan KoFFman, 2011

2.Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.

3.William Stallings,"Computer Organization and Architecture: Designing for Performance",- Tenth Edition, Pearson/PHI, 2015.

4. Carl Hamacher, ZvonksVranesic, SafeaZaky,,"Computer Organization,5/E",Vth Edition, McGraw Hill,2011.

REFERENCE BOOKS:

1. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

2. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi, Springer Int. Edition.

3. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.

4. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course Title	APPLIED MACHINE LEARNING IN PYTHON				B.Tech CSE - VI Sem (Honours Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2092503	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- Understand the Machine Learning Basic concepts.
- Understand the need of python in machine learning.
- To Analyse Supervised Learning Algorithms.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	students will be able to identify the difference between a supervised (classification) and unsupervised (clustering) technique
CO 2	Understand Supervised Learning Algorithms.
CO 3	Identify which technique they need to apply for a particular dataset and need, engineer features to meet that need, and write python code to carry out an analysis.

UNIT-I

Machine learning basics: The need for Machine learning, understanding machine learning, machine learning methods, Supervised learning, Un supervised learning, semi supervised learning, reinforcement learning.

UNIT-II

The Python Machine Learning Ecosystem: Python Introduction, strengths, pitfalls, setting up a python Environment, Why Python for Data science.
Introducing thePython Machine Learning Ecosystem: Jupiter notebooks,Numpy, Pandas.

UNIT-III

Processing, Wrangling and Visualizing data: Data collection, Data description, Data Wrangling, data Summarization, Data Visualization.

UNIT-IV

Machine Learning Algorithms: Introduction to Classification, **Logistic Regression**: Introduction, Types of Logistic Regression,Binary Logistic regression Model, Multinomial Logistic regression Model,**Support vector machine:** Introduction to SVM, Pros and Cons of SVM classifier.

UNIT-V

Classification Algorithms: Decision Tree, Naïve-Bayes, Random Forest.
Case studies: Analyzing Bike sharing Trends.

TEXT BOOKS:

1.Practical Machine Learning with Python- A problem solver's Guide to Building Real world intelligent Systems, Dipanjan Sarkar, Raghav Bali, Tushar Sharma.Apress publications.

2.Introduction to Machine Learning with Python- A Guide for Data Scientists, Andreas C.Miiller and sarah Guido, O'REILLY publications.

REFERENCES:

Machine Learning with Python tutorials point.www.tutorialspoint.com

Course Title	DEEP LEARNING				B.Tech CSE - VI Sem (Honours Degree)		
Course Code	Hours/Week			Credits	Maximum Marks		
2092504	L	T	P	C	Continuous Internal Assessment	End Exams	Total
	4	0	0	4	40	60	100
Mid Exam Duration: 90 Minutes				End Exam Duration: 3Hrs			

Course Objectives:

- Study about basic concepts of deep learning
- Introduce deep learning algorithms, te problem settings and their applications to solve real world problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the historical trends in deep learning and use Tensor flow for performing Linear Regression, Gradient Descent, optimizers, graph visualization and training curves.
CO 2	Summarize the fundamentals of Artificial Neural Networks.
CO 3	Understand the training of Deep Neural Nets
CO 4	Understand the Convolutional Neural Networks Architecture.
CO 5	Understand the Recurrent Neural Networks and deep RNN training.

UNIT-I

Introduction to Deep Learning: Introduction, Historical trends in Deep Learning

Up and Running with TensorFlow

Installation, Creating Your First Graph and Running It in a Session, Managing Graphs, Lifecycle of a Node Value, Linear Regression with TensorFlow. Implementing Gradient Descent, Feeding Data to the Training Algorithm, Saving and Restoring Models, Visualizing the Graph and Training Curves Using TensorBoard, Name Scopes, Modularity, Sharing Variables.

UNIT-II

Introduction to Artificial Neural Networks From Biological to Artificial Neurons, Training an MLP with TensorFlow's High-Level API, Training a DNN Using Plain TensorFlow, Fine-Tuning Neural Network Hyperparameters.

UNIT-III

Training Deep Neural Nets

Vanishing/Exploding Gradients Problems, Reusing Pretrained Layers, Faster Optimizers, Avoiding Over fitting Through Regularization.

UNIT-IV

Convolutional Neural Networks

The Architecture of the Visual Cortex, Convolutional Layer, Pooling Layer., CNN Architectures : LeNet5, AlexNet, GoogLeNet, ResNet.

UNIT-V

Recurrent Neural Networks Recurrent Neurons, Basic RNNs in TensorFlow, Training RNNs, Deep RNNs.

Text Books:

1. “Deep Learning” Ian Goodfellow Yoshua Bengio Aaron Courville, MIT Press book.
2. “Hands-On Machine Learning with Scikit-Learn and TensorFlow” March 2017: First Edition

Reference Books:

1. “Neural Networks and Deep Learning”, Michael Nielsen.
2. 2. “Neural Networks and Deep Learning “ Aggarwal, Charu C.Springer International Publishing.

Web References:

1. https://www.coursera.org/specializations/deep-learning?
2. https://www.coursera.org/learn/introduction-tensorflow?

<table>
<tr><td>Course Title</td><td colspan="2">INTRODUCTION TO BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS</td><td colspan="3">B.Tech CSE - VII Sem (Honours Degree)</td></tr>
<tr><td>Course Code</td><td>Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2092505</td><td rowspan="2">MOOC</td><td rowspan="2">2</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="2">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="6">Course Objectives:
Understand how block chain systems work
To securely interact with them
Integrate ideas from block chain technology into their own projects</td></tr>
<tr><td colspan="6">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="5">Recall cryptographic concepts, hashing, public key cryptosystems.</td></tr>
<tr><td>CO 2</td><td colspan="5">Understand basic concept of Block chain technology</td></tr>
<tr><td>CO 3</td><td colspan="5">Understand design principles of Bitcoin and Alternative coins</td></tr>
<tr><td>CO 4</td><td colspan="5">Study on the usecases of Block chain technology.</td></tr>
</table>

UNIT-I

Introduction – basic ideas behind blockchain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to BitcoinBlockchain.

UNIT-II

BitcoinBlockchain and scripts, Use cases of BitcoinBlockchain scripting language in micropayment, escrow etc Downside of Bitcoin – mining.

UNIT-III

Alternative coins – Ethereum and Smart contracts , IOTA, The real need for mining – consensus– Byzantine Generals Problem, and Consensus as a distributed coordination problem – Coming to private or permissioned blockchains.

UNIT-IV

Permissioned Blockchain and use cases – Hyperledger, Corda.

UNIT-V

Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems.

Text Book:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books:

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts

https://www.gitam.edu/departments_cms/assets/uploads/syllabus/1566624781_Certification_course_on_Blockchain_Technology_w__e__f__2019-20_admitted_batch.pdf

SWAYAM NPTEL Link: https://onlinecourses.nptel.ac.in/noc20_cs01/preview

Course Title	BIG DATA & HADOOP		B.Tech CSE - VII Sem (Honours Degree)		
Course Code	**Hours/Week**	**Credits**	**Maximum Marks**		
2092506	**MOOC**	2	**Continuous Internal Assessment**	**End Exams**	**Total**
			40	60	100
Mid Exam Duration: 90 Minutes		**End Exam Duration: 3Hrs**			

Course Objectives:

- To introduce big data concepts.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- Understanding Hadoob.
- Understanding Big data Applications (HBASE, HIVE)
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Installation of Hadoop Tools.
CO 2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
CO 3	Working with HBASE and HIVE.
CO 4	Achieve adequate perspectives of big data in various applications like recommender systems, social media applications etc

UNIT-I

Introduction to Big Data, What is Big Data Why Big Data is Important, Meet Hadoop, Big Data Storage and Analysis, Comparison with other systems, Grid Computing, A brief history of Hadoop, Apache Hadoop and the Hadoop Eco system, Linux refresher VM Ware Installation of Hadoop.

UNIT-II

The design of HDFS, HDFS concepts, Command line interface to HDFS Hadoop File Systems, Interfaces Java Interface to Hadoop, Anatomy of a file read, Anatomy of a File Write, Replica placement and Coherency Model, Parallel copying with distep, Keeping an HDFS cluster balanced.

UNIT-III

Introduction. Analyzing data with unix tools, Analyzing data with Hadoop, Java Map Reduce classes (New API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API, Setting up the development environment. Managing configuration, Writing a unit test with MRunit, Running a Job in local job runner. Running on a cluste. Launching a job. The MapReduce WebUI.

UNIT-IV

Classic Mapreduce. Job submission, Job Initialization, Task Assignment, Task execution, Progress and status updates, Job Completion, Shuffle and sort on Map and reducer side, Configuration tuning. Map Reduce. Types, Input formats, Output formats, Sorting Map side and Reduce Side joins.

UNIT-V

The Hive Shall, Hive services, Hive clients, The meta store. Comparison with traditional databases, Hive QI,

Hbase: Concepts, Implementation, Java and Map reduce clients. Loading data, Web queries.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide" , 3rd Edition, O'Reilly Publications, 2012
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Undetstanding Big Data Analytics for Enterprise class Hadoop and Streaming Data", 1st Edition, TMH, 2012.

Reference links:

https://www.coursera.org/learn/hadoop#syllabus
https://www.coursera.org/lecture/hadoop/introduction-to-apache-hive-0AToF

Course Title	Introduction to Industry 4.0 and Industrial IOT		B.Tech CSE - VII Sem (Honours Degree)		
Course Code	**Hours/Week**	**Credits**	**Maximum Marks**		
2092507	**MOOC**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	40	60	100
Mid Exam Duration: 90 Minutes		**End Exam Duration: 3Hrs**			

Course Objectives:

- Introduction to Sensors, Communication and Networking
- Introducing Cyber Security in Industry 4.0
- To learn Big Data Analytics and SDN
- To know about various application domains

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding various sensors in IoT
CO 2	Understanding Cyber Security with IIoT
CO 3	Understanding various application domains
CO 4	Build skills in Hardware, Software, Application Systems, and Data management

UNIT-I

Introduction: Sensing & actuation, Communication, Networking.
Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories
Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis.

UNIT-II

Cyber security in Industry 4.0, Basics of Industrial IoT: Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.
IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture.

UNIT-III

Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing, IIoT Communication. Industrial IoT- Layers: IIoT Communication, IIoT Networking. Industrial IoT: Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science, R and Julia Programming, Data Management with Hadoop.

UNIT-IV

Big Data Analytics and Software Defined Networks: SDN in IIoT, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing in IIoT.

Security and Fog Computing - Fog Computing in IIoT, Security in IIoT, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry.

UNIT-V

Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Case studies. Self-Referential Structures and Introduction to Lists.

https://nptel.ac.in/courses/106/105/106105195/