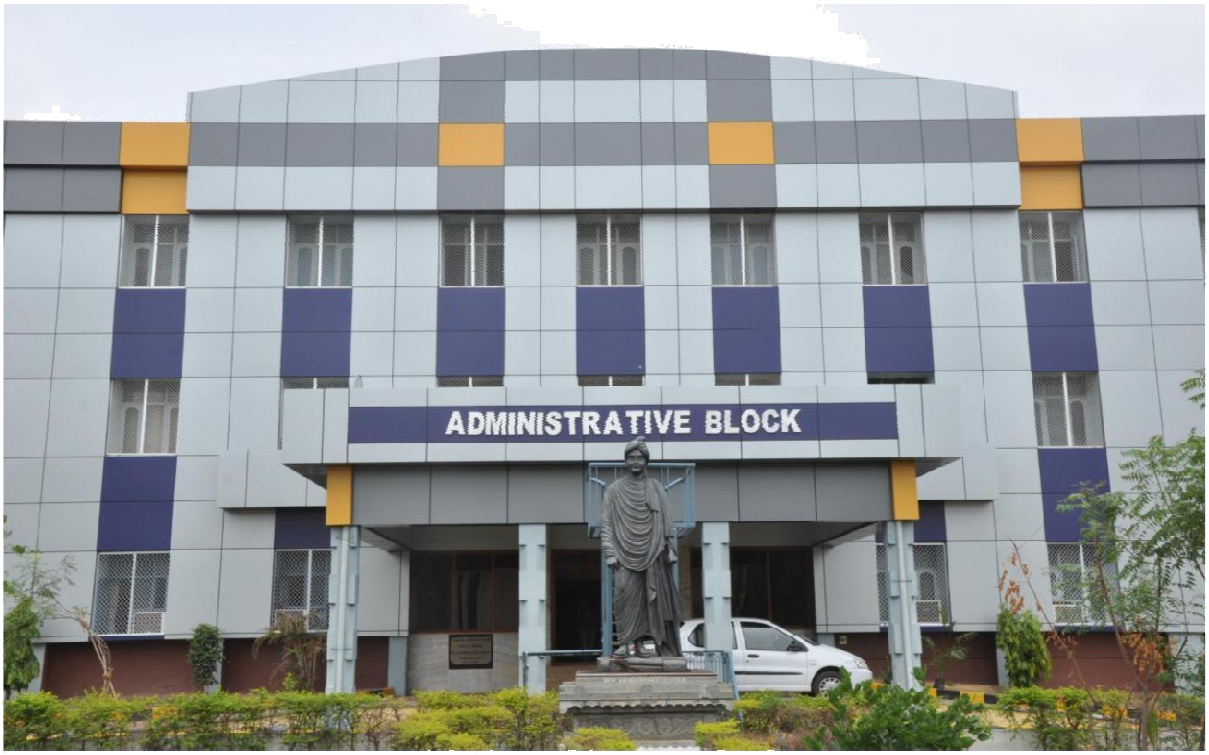

Scheme – 2023

Department of Computer Science & Engineering

G. Pulla Reddy Engineering College (Autonomous): Kurnool

Accredited by NBA of AICTE and NAAC of UGC

Affiliated to JNTUA, Anantapuramu

Scheme and Syllabus for

Honors in

COMPUTER SCIENCE & ENGINEERING

(With Effect from the Batch Admitted in 2023-24)

G. PULLA REDDY ENGINEERING COLLEGE (Autonomous) : KURNOOL

SCHEME -23

B. TECH – CSE Honors

Applicable from the Academic Year 2023-24 onwards

B.Tech – CSE Honors

S.No	Title	L	T	P	Credits	CIA	End Exam	Total Marks
1	No SQL Databases	3	0	0	3	30	70	100
2	Quantum Computing	3	0	0	3	30	70	100
3	No SQL Lab	0	0	3	1.5	30	70	100
4	Software Defined Data Center	3	0	0	3	30	70	100
5	Cloud Security	3	0	0	3	30	70	100
6	Quantum & Cloud Computing Lab	0	0	3	1.5	30	70	100
7	Robotics and Intelligence Systems	3	0	0	3	30	70	100
				Total	**18**			

NO SQL DATABASES (NSD)								
Honors in: CSE					**Scheme: 2023**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
HCS01	**H**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes: At the end of the course the student will be able to

CO1:	Understand the fundamental concepts, history, and emergence of NoSQL databases and differentiate them from traditional relational database systems.
CO2:	Compare and contrast the architecture and use-cases of various NoSQL database types including Document, Column-Family, Key-Value, and Graph databases.
CO3:	Implement key-value solutions for suitable application domains using tools like Riak, Redis, and Firebase.
CO4:	Demonstrate the use of document-oriented NoSQL databases like MongoDB by performing CRUD operations, data modeling, indexing, and replication.
CO5:	Illustrate the architecture, data organization, and scalability features of column-oriented databases such as HBase and Cassandra.

UNIT – I

Overview and history of No SQL Data bases: Definition of the four types of No SQL data bases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, The emergence of No SQL, Key Points.

UNIT – II

RDBMS Vs No SQL: Comparison of relational databases to new No SQL stores, Mongo DB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges No SQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, Map Reduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT – III

Key Value Data bases: No SQL Key-Value databases using Riak, Key-Value Data bases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase-Cloud hosted No SQL Database.

UNIT – IV

Document Data bases: No-SQL Key-Value Databases using Mongo DB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics.

UNIT – V

Column Oriented Databases: Column-oriented No SQL databases using Apache HBASE, Column-oriented No SQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query

Features, Scaling.
Text Books:
1. Sadalage, P. & Fowler, No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.
Reference Books:
1. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the No SQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 1934356921
2. Guy Harrison, Next Generation Database: No SQL and big data, Apress.
Online Learning Resources
1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

QUANTUM COMPUTING (QC)								
Honors in: CSE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
HCS02	**H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course the student will be able to

CO1:	Understand basics maths of quantum computing
CO2:	Understand physical implementation of Qubit
CO3:	Understand physical realization and implementation of qubits. Understand Quantum algorithms and their implementation
CO4:	Understand quantum algorithms and their implementation.
CO5:	Understand the impact of quantum computing on cryptography and information security.

UNIT – I

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory.

Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically.

UNIT– II

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromo dynamics, Feynman Diagram.

UNIT– III

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The Wave Quantum Architecture.

Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

UNIT– IV

Quantum Algorithms: What Is an Algorithm? Deutsch‘s Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon‘s Algorithm, Shor‘s Algorithm, Grover‘s Algorithm.

UNIT– V

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve The Impact of Quantum Computing on Cryptography – Asymmetric Cryptography, Specific Algorithms, Specific Applications

Text Books:

1. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

2. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press

Reference Books:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci

2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II

3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

Web References:

1.https://onlinecourses.nptel.ac.in/noc25_cs95/preview

2.https://qiskit.org/textbook/preface.html

3.https://www.youtube.com/playlist?list=PLOFEBzvs-Vvp2xg9-POLJhQwtVktlYGbY

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

NoSQL LAB								
Honors in: CSE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
HCS03	**H**	**0**	**0**	**3**	**1.5**	**30**	**70**	**100**
End Exam Duration: 3 Hrs								
Course Outcomes: At the end of the course the student will be able to								
CO1:	Install and configure MongoDB on a Windows environment.							
CO2:	Demonstrate the creation, modification, and deletion of databases and collections in MongoDB.							
CO3:	Perform CRUD (Create, Read, Update, Delete) operations on MongoDB documents.							
CO4:	Use projection, filtering, sorting, and pagination techniques to query MongoDB collections effectively.							

LIST OF EXPERIMENTS

1. Mongo DB installation and configuration in windows

2. Demonstrate how to create and drop a database in Mongo DB.

3. Creating the Collection in Mongo DB on the fly

4.Creating collection with options before inserting the documents and drop the

5. Mongo DB insert document a. Insert single document b. Insert multiple documents in collection

a. Insert single document

b. Insert multiple documents in collection

6. Querying all the documents in json format and Querying based on the criteria.

7.Mongo DB update document

a. Using update () method.

b. Using save () method

8. MongoDB delete document from a collection.

a. Using remove () method.

b. Remove only one document matching your criteria

c. Remove all documents

9. Mongo DB Projection.

10. limit() ,skip(), sort() methods in Mongo DB

Additional Experiments:

1. Mongo DB indexing

a. Create index in Mongo DB

b. Finding the indexes in a collection

c. Drop indexes in a collection d. Drop all the indexes

2. Mongo DB with java and PHP

a. Create a simple application that uses Mongo DB with Java

b. Create a simple application that uses Mongo DB with PHP

SOFTWARE DEFINED DATA CENTER (SDDC)								
Honors in: CSE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
HCS04	**H**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course the student will be able to

CO1:	Compare conventional and modern data centers in terms of architecture, scalability, and management
CO2:	Differentiate between cloud computing and software-defined data centers based on deployment and functionality.
CO3:	Compare Virtualization with conventional techniques
CO4:	Explore the techniques of Software Defined Compute, Storage and Networking components
CO5:	Able to manage Software Defined Data Centers and Develop the techniques for future Data Centers.

UNIT – I

Introduction: Data Center evolution, A history of Modern Data Center, Focus on cost reduction, Focus on Customer service in the business, Flattening of the IT organization, IT as an operational Expense, Monolithic Storage Array rise and fall, Move From Disk to Flash, Emergence of Convergence, The Role of Cloud computing. Introduction

UNIT– II

Emerging Data Center Trends Emergence of SDCC, Commoditization of Hardware, Software Defined – Compute, Storage, Networking and Security, Software Defined Storage (SDS), Hyper convergence, Hyper Converged Infrastructure (HCI) and SDS relationship, Flash in Hyper convergence, Modern IT business Requirements.

UNIT– III

Data Center Agility: Principles and Strategies, Transform Data Center, Align Data Center and Business Needs, Server virtualization, VDI, Eliminate and Implement Monolithic to Hyper convergence, Full Stack Management.

UNIT– IV

Hyper converged Infrastructure Software: Defined Storage, SDS comparison to Traditional Storage, SDS requirements, SDS in Hyper converged, Hyper convergence Design Model, Virtual Storage appliances, Appliance vs. Software/Reference Architecture,

UNIT– V

Future Data Centers: Data growth, Storage capacity, flash storage deployment, Deployment Experiences SDS and HCI, IT transformations- Automation, Orchestration, Dev Ops, Open Standards and Interoperability, Performance Benchmarking Standards, Future Trends, Containers Instead of virtual machines, Open Source tools, Beyond Today‘s Flash, Pooling of Resources.

Text Books:

1.Building a Modern Data Center, Principles and Strategies of Design, Scott D.Lowe, James Green, David Davis. Actual Tech Media, 2016.

Reference Books:

1. Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center, Second Edition, HwaiyuGeng P.E.,2021 John Wiley & Sons.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

CLOUD SECURITY (CS)

Honors in: CSE | **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
HCS05	H	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes: At the end of the course the student will be able to

CO1:	Understand the basic cloud computing concepts and models.
CO2:	Understand the various cloud security and privacy issues.
CO3:	Analyse the various threats and Attack tools.
CO4:	Understand the Data Security and Storage
CO5:	Analyse the Security Management in the Cloud

UNIT – I

Overview of Cloud Computing: Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead. Introduction to Cloud Security: Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model..

UNIT– II

Cloud Security and Privacy Issues: Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud. Infrastructure Security: The Network Level, the Host Level, the Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.

UNIT– III

Threat Model and Cloud Attacks: Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks, Attack Tools-Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.

UNIT– IV

Data Security and Storage: Information Security Basic Concepts, an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

UNIT– V

Security Management in the Cloud: Evolution of Security Considerations, Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms, Variations and Special Cases for Security Issues with Cloud Computing, Side Channel Security Attacks in the Cloud. Security Management in the Cloud- Security Management Standards, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

Text Books:

1. Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era., ―Cloud Security Attacks, Techniques, Tools, and Challenges‖, 1st Edition, 2022, CRC press.

2. D Tim Mather, Subra Kumaraswamy, and ShahedLati―Cloud Security and Privacy‖,1st Edition, 2019, O'Reilly Media, Inc.

Reference Books:

1. Naresh Kumar Sehgal Pramod Chandra, P. Bhatt John M. Acken., ―Cloud Computing with Security Concepts and Practices‖, 2nd Edition Springer nature Switzerland AG 2020.

2. Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press

3. Raj Kumar Buyya,—Cloud Computing Principles and Paradigms‖, John Wiley.

Web References:

1.https://onlinecourses.nptel.ac.in/noc19_cs64/preview

2.https://archive.nptel.ac.in/courses/106/105/106105167/

3.Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era., —Cloud Security Attacks, Techniques, Tools, and Challenges‖, 1st Edition, 2022, CRC press.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

QUANTUM & CLOUD COMPUTING LAB (QC (P))								
Honors in: CSE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
HCS06	**H**	**0**	**0**	**3**	**1.5**	**30**	**70**	**100**

End Exam Duration: **3 Hrs**

Course Outcomes: At the end of the course the student will be able to

CO1:	Implement and compare classical and quantum bits using Qiskit
CO2:	Design and analyze quantum circuits using logic gates and linear algebra principles
CO3:	Simulate and evaluate cloud computing infrastructures including data centers, VM allocation, and scheduling policies
CO4:	Apply resource provisioning techniques to optimize cloud performance and load balancing.
CO5:	Assess cloud security threats by implementing and analyzing DoS attack simulations.

LIST OF EXPERIMENTS

Quantum Computing Lab:

1. **Simulating Classical vs Quantum Bits**
   a. Implement classical bits and qubits using Qiskit.
   b. Compare bit flip vs quantum superposition using Hadamard gates.
2. **Quantum Logic Gates Implementation**
   a. Implement and visualize basic quantum gates (X, Y, Z, H, S, T).
   b. Apply these gates to single and multiple qubits.
3. **Linear Algebra in Quantum Computing**
   a. Represent quantum states using matrices and vectors.
   b. Perform matrix operations (addition, multiplication, tensor product).
4. **Deutsch's Algorithm Implementation**
   a. Demonstrate quantum parallelism using Deutsch's algorithm.

Cloud Computing Lab:

1. **Simulation of a Simple Cloud Data Center:** Create a cloud environment with multiple Hosts, Virtual Machines (VMs), and Cloudlets.
2. **VM Allocation and Scheduling Policies:** Implement and compare Time-Shared and Space-Shared VM allocation policies.
3. **Resource Provisioning and Load Balancing:** Simulate dynamic resource allocation for better load balancing.
4. **Cloudlet Scheduling Algorithms:** Implement and compare FCFS (First-Come-First Serve), Round Robin, and Priority-Based Scheduling.
5. **Performance Analysis of Cloud Deployment Models:** Simulate and compare Public, Private, Hybrid, and Community Cloud environments.
6. **Simulating Denial of Service (DoS) Attacks**: Implement a scenario where multiple requests overload a cloud server.

ROBOTICS AND INTELLIGENT SYSTEMS (RIS)								
Honors in: CSE						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
HCS07	**H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course the student will be able to

CO1:	Understand general concepts of Robotics and intelligent systems.
CO2:	Understand robotics control systems.
CO3:	Analyze and understand the various programming languages of robotics
CO4:	Understand Industrial robots and its applications.
CO5:	Create IoT solutions using sensors, actuators and Devices

UNIT – I

Introduction to Robotics: Back ground, Historical development, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing

UNIT– II

Robot Arm Kinematics and Dynamics: Introduction to Kinematics, Direct and Inverse Kinematics Problem and solution, Dynamics introduction, Lagrange-Euler Formulation, Newton Euler Formation, Generalized D'Alembert Equations of motion.

UNIT– III

Sensing and Vision: Introduction to Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing, Image acquisition, Illumination techniques, Imaging Geometry, Recognition and Interpretation.

UNIT– IV

Robot Programming Languages: Introduction to Robot Programming Languages, Characteristics of Robot Level Languages, three levels of robot programming, requirements of a robot programming language, Task Level Languages, problems peculiar to robot languages, Introduction to Robot Operating System (ROS)

UNIT– V

Robot Intelligence: Introduction, State Space Search, Problem Reduction, Use of Predicate Logic, Means-Ends Analysis, Problem solving, Robot Learning, Robot Task Planning, Basic Problems in Task Planning, Expert systems and knowledge engineering.

Text Books:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence

2. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.

Reference Books:

1. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition

Web References:

1.https://nptel.ac.in/courses/107106090

2.https://nptel.ac.in/courses/112108298

Question Paper Pattern:

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