DJS-23 HONORS Syllabus

Semester IV

ACADEMIC YEAR: 2024-25

B. Tech. Program (Electronics & Telecommunication Engineering) (DJS23 Scheme) HONORS
Track: AIML (Sem IV)

Sr. no	Course code	Course	Teaching scheme (Hrs.)				Continuous Assessment (A) (marks)			Semester end Assessment (B) (Marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA(A)	Th	O	P	O & P	Total SEA(B)		
Semester IV																
1	DJS23EH1251	Artificial Intelligence	3	-	-	3	40	-	40	60	-	-	-	60	100	3
		Total	**3**	**-**	**-**	**3**	**40**	**-**	**40**	**60**	**-**	**-**	**-**	**60**	**100**	**3**

HONORS Track: IoT & NextGen Networks (Sem IV)

Sr. no	Course code	Course	Teaching scheme (Hrs.)				Continuous Assessment (A) (marks)			Semester end Assessment (B) (Marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA(A)	Th	O	P	O & P	Total SEA(B)		
Semester IV																
1	DJS23EH2251	IoT System & Design	3	-	-	3	40	-	40	60	-	-	-	60	100	3
		Total	**3**	**-**	**-**	**3**	**40**	**-**	**40**	**60**	**-**	**-**	**-**	**60**	**100**	**3**

HONORS Track: VLSI Design (Sem IV)

Sr. no	Course code	Course	Teaching scheme (Hrs.)				Continuous Assessment (A) (marks)			Semester end Assessment (B) (Marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA(A)	Th	O	P	O & P	Total SEA(B)		
Semester IV																
1	DJS23EH3251	Digital System Design Using HDL	3	-	-	3	40	-	40	60	-	-	-	60	100	4
	DJS23EH3251L	Digital System Design Using HDL Laboratory	-	2	-	1	-	25	25	-	25	-	-	25	50	
		Total	**3**	**2**	**-**	**4**	**40**	**-**	**65**	**60**	**25**	**-**	**-**	**85**	**150**	**4**

HONORS Track: Robotics & Automation (Sem IV)

Sr. no	Course code	Course	Teaching scheme (Hrs.)				Continuous Assessment (A) (marks)			Semester end Assessment (B) (Marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA(A)	Th	O	P	O & P	Total SEA(B)		
Semester IV																
1	DJS23EH4251	Basics of Control Systems	3	-	-	3	40	-	40	60	-	-	-	60	100	3
		Total	**3**	**-**	**-**	**3**	**40**	**-**	**40**	**60**	**-**	**-**	**-**	**60**	**100**	**3**

Program: Electronics and Telecommunication Engineering	S. Y. B. Tech	Semester: IV
Course: Artificial Intelligence (DJS23EH1251)		

Pre-requisite:

1. Mathematics for AIML (DJS23ECH1301)

Objectives: `

1. To conceptualize the basic ideas and techniques underlying the design of intelligent systems.
2. To make students understand advanced representation formalism and search techniques.

Outcomes: On completion of the course, the learner will be able to:

1. Understand basic building blocks of AI present in intelligent agents.
2. Design appropriate problem-solving method for an agent to find a sequence of actions to reach goal state.
3. Analyze various AI approaches to knowledge– intensive problem solving, reasoning, and planning.
4. Understand applications of AI in different fields.

Artificial Intelligence (DJS23EH1251)		
Unit	**Description**	**Duration**
1	**Intelligent Agents:** Introduction, AI Intelligent Agents; Structure of Intelligent Agents; Agents and Environments, Types of Agents.	03
2	**Introduction to AI Problems:** Introduction; Turing Test; Problems in AI	02
3	**Solving Problems in AI (Searching Algorithms as Applied in AI):** **Uninformed search** BFS, DFS, Depth First with Iterative Deepening, Generate and Test Search Algorithms. **Informed/Heuristic search** Hill Climbing, Steepest Ascent Hill Climbing, Problems in Hill Climbing, Greedy Nearest Neighbor, Best First Search, Greedy Best First Search, Beam Search, A* search, AO* search algorithms. **Constraint satisfaction Search** Crypto Arithmetic, Back Tracking: N Queens Problem. **Problem Reduction Search** AND/OR Graphs, Game Trees. **Adversarial search in Games** The Min-Max Algorithm, Alpha Beta Pruning.	 3 5 4 4 4
4	**Knowledge Representation and Reasoning:** **Logical Agents** Knowledge Based Agents, Wumpus World Knowledge Base **Propositional Logic** Syntax, Semantics, Inference, Resolution, Problems in Propositional Logic **First Order Logic** Syntax and Semantic of FOL, Using FOL **Inference in FOL** Propositional vs. First-Order Inference, Unification, Resolution.	9
5	**Application of AI:** Natural Language Processing and Understanding, Ecommerce, E-tourism, Industry, Healthcare, vision, and Robotics.	05
	Total	**39**

Books Recommended:

Text books:

1. Stuart J. Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*", 4th Edition" Pearson Education, 2020.
2. Ben Coppin, "*Artificial Intelligence Illuminated*", Narosa Publishing House.

Reference Books:

1. Lavika Goel, "*Artificial Intelligence: Concepts and Applications*," Wiley 2021.
2. Saroj Kaushik," Artificial *Intelligence*" 2nd Edition, Cengage Publication
3. Elaine Rich, Kevin Knight, Shivshankar B Nair, "*Artificial Intelligence*", 3rd Edition, Mc Graw Hill publication.

Video Links:

1. https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/video_galleries/lecture-videos/
2. 'Artificial Intelligence' Video Lectures from IIT Madras by Prof. Deepak Khemani - Computer Science and Engineering NPTEL Video Lectures (nptelvideos.com)

Prepared by Ranjushree Pal Supriya Dicholkar	Checked by	Head of the Department	Principal

Honors in IoT & NextGen Networks		
Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech**	**Semester: IV**
Course: IoT System Design (DJS23EH2251)		
Course: IoT System Design Laboratory (DJS23ELH2401)		

Pre-requisite:

1. Sensor and Actuator for IoT (DJS23ECH2301)
2. Basic Electrical Engineering & Digital Electronics (DJS23FCES103)
3. Electrical Networks (DJS23FCPC2EC)

Objectives: `

1. To provide understanding of enabling technologies.
2. To provide Understanding about IoT sensors and their interfacing.
3. To familiarize about protocols for IoT, Application building with IoT.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the enabling technologies.
2. Select sensors suitable for required application.
3. Analyze protocols for IoT
4. Visualize the power of data from the IoT
5. Build the application with IoT

IoT System Design **(DJS23EH2251**)		
Unit	**Description**	**Duration**
1	Introduction to Internet of Things Introduction and Definition of Internet of Things , IoT Growth- A statistical View, Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, IoT Enabling Technologies, IoT Challenges, IoT Levels, Cyber Physical system versus IoT, Wireless sensor Network versus IoT, Interfacing with any sensor, Microcontrollers : A Quick walkthrough, Advanced RISC Machine : A Quick Overview.	08
2	Protocols for IoT Messaging and Transport: Messaging Protocols: Message Queuing Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol (XMPP), Data Distribution Service (DDS), Transport Protocols: Bluetooth Low Energy, Light Fidelity(Li-Fi), Addressing and Identification: A Quick OverviewIPv4,IPv6,IPv5, Uniform Resource Identifier (URI)	10
3	**Cloud for IoT** IoT with Cloud- Challenges, Selection of cloud service provider, Introduction to Fog Computing, Cloud computing : security aspects, Architectural Design of	06

	Compute and Storage Clouds AWS and AZURE	
4	**Data Analytics- Visualizing the power of data from IoT** Data Analysis, Machine Learning, Types of Machine learning Models, Model building process, Modelling algorithms, Model Performance, Big data Platform, Big Data Pipeline, Real Life Projects, Recommendation in IoT Gadgets	08
5	**Application Building with IoT** Introduction, Smart Perishable Tracking with IoT and sensors, Smart Healthcare, Smart Inflight lavatory maintence with IoT, IoT – Based Application to monitor water quality, Smart warehouse Monitoring, Smart Retail, Integrated Vehicle Health management	07
	Total	**39**

IoT System Design Laboratory **(**DJS23ELH2401)	
Exp.	**Suggested Experiment List**
1	GPIO toggle, Interrupts and ISR
2	Half and Full duplex communications
3	UDP client server model – local host
4	UDP client server model – local network
5	TCP client server model – local host
6	TCP client server model – local network
7	IoT sensors data into data base management system
8	Transmission of sensor data to DB application running on server side
9	Interfacing the camera module and data transmission to server
10	Case study based on current trends and advancements on IoT
	Any other experiment may be included, which would help the learner to understand the topic/concept

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, *Internet of Things*, 2nd Edn, Wiley, 2020.
2. Dac-Nhuong Le, Chintan Bhatt, Mani Madhukar, *Security Designs for the Cloud, IoT, and Social Networking*, John Wiley & Sons, 2019.
3. Marco Schwatrz, *Internet of Things with Arduino Cookbook*, Packt Publications, 2016.
4. Rajkumar Buyya, Christian Vecchiola. S. Thamarai Selvi, *Mastering Cloud Computing*, McGraw Hill Education, 2013.

Reference Books:

1. Agus Kurniawan, *Learning AWS IoT Packt* Publishing, 2018.
2. Nick Antonopoulos and Lee Gillam, *Cloud Computing: Principles, Systems and Applications*, 2nd Edn, Springer, 2017.

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Honors in VLSI Design	**Semester: IV**
Program: Electronics and Telecommunication Engineering	
Course: Digital System Design using HDL (DJS23EH3251)	
Course: Digital System Design using HDL Laboratory (DJS23EH3251L)	

Pre-requisite:

1. Digital System Design (DJS23EPC203)

Objectives:

1. Develop the ability to model digital circuits using dataflow, structural, and behavioral styles.
2. Design and simulation of combinational and sequential circuits using HDL.
3. Implement finite state machines (FSMs) using HDL.
4. Implementation of digital circuits on FPGA/CPLD.

Outcomes: On completion of the course, the learner will be able to:

1. Demonstrate the FPGA design flow.
2. Model digital circuits using switch level and gate level modeling style.
3. Model digital circuits using dataflow modeling style.
4. Model digital circuits using behavioral modeling style
5. Implement digital circuit on FPGA/CPLD.

Digital System Design using HDL (DJS23EH3251)		
Unit	**Description**	**Duration**
1	**Introduction to Verilog:** Overview of digital design with Verilog HDL, Typical design flow, Verilog Operators and Modules, Verilog Ports, Data types and Assignments, Styles of Description.	**05**
2	**Switch level modeling:** Modeling of CMOS gates and Boolean functions, Modeling using transmission gates. **Gate level modeling:** Gate types, Gate delays, Gate level modelling of Adder, Comparator, Decoder, Encoder, Multiplexer, De-multiplexer, Verilog modeling of flip-flops.	**09**
3	**Dataflow modeling:** Basics of dataflow modeling, Continous assignments, delays, Expression, Operators and Operands, Synthesis of combinational logic using Verilog, Synthesis of sequential logic using Verilog.	**09**
4	**Behavioural modeling:** Basics of behavioral modeling, Structured procedures: initial and always, Procedural Assignments: Blocking and Non-blocking assignments, Conditional statements, Multiway Branching, case statement, Casex and Casez Statements, Loops, Sequential and Parallel blocks, Verilog modeling of combinational circuits, counters, shift registers, sequence detector.	**09**

5	**Overview of FPGA and CPLD Architectures and Technologies**: FPGA Architecture (Xilinx XC4000), coarse vs fine grained, Antifuse, SRAM and EPROM based FPGAs, FPGA logic cells, interconnection network and I/O Pad, architecture of CPLD, Xilinx XC 9500 CPLD.	**07**
	Total	**39**

Digital System Design using HDL Laboratory (DJS23EH3251L)	
Exp.	**Suggested Experiment List**
1	To simplify the given Boolean expressions and realize using Verilog program.
2	To realize half adder and full adder circuits using Verilog data flow description.
3	To realize 4-bit ripple carry adder using data flow Verilog program.
4	To realize half-subtractor and full-subtractor circuits using data flow Verilog program.
5	To realize 4-bit CLA adder using data flow Verilog program.
6	To realize 4-bit comparator using data flow Verilog program.
7	To realize the following Code converters using Verilog Behavioral description: Gray to binary and vice versa.
8	To realize the following Code converters using Verilog Behavioral description: Binary to excess3 and vice versa.
9	To realize using Verilog Behavioral description: 8:1 multiplexer.
10	To realize 8:3 encoder, Priority encoder using Verilog Behavioral description.
11	To realize using Verilog Behavioral description: 1:8 De-multiplexer
12	To realize 3:8 decoder using Verilog Behavioral description.
13	To realize 2-bit comparator using Verilog Behavioral description.
14	To realize using Verilog Behavioral description: Flip-flops: a) JK type b) SR type c) T type and d) D type
15	To realize Counters - up/down using Verilog Behavioral description.
16	Write a VHDL/Verilog code to realize the inverter. Simulate & synthesize the same on FPGA/CPLD Board.
17	Write a VHDL/Verilog code to realize the Transmission Gate. Simulate & synthesize the same on FPGA/CPLD Board.
18	Write a VHDL/Verilog code to realize the universal gates Simulate & synthesize the same on FPGA/CPLD Board.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus to be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. John F. Wakerly, *Digital Design Principles and Practices*, Pearson Education, 5th Edition, 2021.

2. Samir Palnitkar, *Verilog HDL A guide to Digital Design and Synthesis*, SunSoft Press, 2nd Edition, 2003.

Reference Books:

1. Michael D. Ciletti, *Advanced Digital Design with Verilog HDL*, PHI, 2005.
2. T. R. Padmanabhan and B. Bala Tripura Sundari, *Design through Verilog HDL*, IEEE Press, 2004.
3. Peter Ashenden, *Digital Design: An Embedded Systems Approach using Verilog*, Elsevier, 2008.
4. Stephen Brown & Zvonko Vranesic, *Digital Logic Design with Verilog HDL*, Tata McGraw Hill Ltd, 2nd Edition 2007.
5. W. Wolf, *FPGA based system design*, Pearson, 1st Edition, 2004.

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Honors in Honors Robotics & Automation		
Program: Electronics and Telecommunication Engineering	**S. Y. B. Tech**	**Semester: IV**
Course: Basics of Control Systems (DJS23EH4251)		

Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics (DJS22FECBE)
2. Engineering Mathematics –I (DJS22FEC11)
3. Engineering Mathematics - II (DJS22FEC21)

Objectives:

1. To provide fundamental concept of control systems.
2. To introduce mathematical modelling, time domain analysis & frequency domain analysis.
3. To develop concepts of stability and its assessment criteria of the system.
4. To study basic concepts of controllers.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the basic concepts of control system.
2. Derive the mathematical model of different type of the systems.
3. Analysis of systems in time and frequency domain.
4. Understand & Find stability of given system using appropriate criteria.
5. Apply the control theory to design the conventional controllers widely used in the industries.

Basics of Control Systems (DJS23EH4251)		
Unit	**Description**	**Duration**
1	**Introduction to Control Systems** • Open loop, closed loop systems, feed forward control, & adaptive control systems, Examples of control systems. • Modeling: Types of models, impulse response model, transfer function model. • Dynamic Response: Standard test signals, transient and steady state behavior control systems, • Steady state errors in feedback control systems and their types.	08
2	**Mathematical Modeling of Systems** • Conversion of block diagram to signal Flow Graph and Vice-versa. • Transfer Function models of various Electrical systems. • Block diagram reduction for single inputs single outputs(SISO) and multiple inputs multiple outputs(MIMO) systems. • signal flow graph, Mason's gain rule.	10

3	**State Variable Models** • Basic concepts, state variable and state models for electrical systems. • General state space representation, conversion between state space and transfer function, • Concept of state transition matrix, properties of state transition matrix. controllability and observability. • Analysis of LTI systems, with Examples.	07
4	**Stability Analysis** • Concept of stability, Routh stability criterion, • Root-locus, general rules for constructing root-locus, • Magnitude and phase plot; • Method of plotting Bode plot; Stability margins on the Bode plots, • Nyquist stability criterions gain and phase margins. • Case study on stability of Control System in Thermal Power Plant.	09
5	**Controllers & Compensators** • Introduction of PI, PD, and PID Controllers. • Lead and Lag compensators. • Case study on a model-driven PID control system.	05
	Total	**39**

Books Recommended:

Text books*:*

1. I. J. Nagrath, Madan.Gopal, "Control System Engineering", New Age InternationalPublication, Seventh Edition, 2021.
2. K.Ogata, "Modern Control Engineering", Pearson Education", Fifth Edition, 2015.

Reference Books:

1. Madan Gopal, "Control Systems Principles and Design", Tata McGraw hill, SeventhEdition, 2012.
2. Ajit K.Mandal, "Introduction to Control Engineering: Modeling, Analysis and Design",New Age International Publication, Second Edition, 2010.
3. S.Hasan Saeed, "Automatic Control System", S.K. Kataria & Sons, Ninth Edition, 2017.
4. Normon S. Nise, "Control System Engineering", John Wiley & sons, Eighth Edition,2020.

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