BBAI501 HUMAN VALUES AND PROFESSIONAL ETHICS

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BBAI501	Human Values and Professional Ethics	60	20	20	-	-	4	-	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives

The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of "right" and "good" in individual, social and professional context

Course Outcomes

1. Help the learners to determine what action or life is best to do or live.
2. Right conduct and good life.
3. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect business.

COURSE CONTENT

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values
4. Values Across Culture

Unit II: Morality

1. Definition, Moral Behaviour and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

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Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Characteristics
2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)
3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

1. Business Ethics its meaning and definition
2. Types, Objectives, Sources, Relevance in Business organisations.
3. Theories of Ethics, Codes of Ethics

Unit V: Globalization and Ethics

1. Sources of Indian Ethos & its impact on human behavior
2. Corporate Citizenship and Social Responsibility – Concept (in Business),
3. Work Ethics and factors affecting work Ethics.

Suggested Readings

1. Beteille, Andre (1991). ***Society and Politics in India***. Athlone Press:New Jersey.
2. Chakraborty, S. K. (1999). ***Values and Ethics for Organizations***. oxford university press
3. Fernando, A.C. (2009). ***Business Ethics - An Indian Perspective*** .India: Pearson Education: India
4. Fleddermann, Charles D. (2012). ***Engineering Ethics***. New Jersey: Pearson Education / Prentice Hall.
5. Boatright, John R (2012). ***Ethics and the Conduct of Business.***Pearson. Education: New Delhi.
6. Crane, Andrew and Matten, Dirk (2015). ***Business Ethics***. Oxford University Press Inc:New York.
7. Murthy, C.S.V. (2016). Business ***Ethics – Text and Cases***. Himalaya Publishing House Pvt. Ltd:Mumbai
8. Naagrajan, R.R (2016). ***Professional Ethics and Human Values***. New Age International Publications:New Delhi.

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B. Tech. in ECIOT w.e.f. 2024

COURSE CODE	CATE GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT702	EC	Security in IOT	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To understand fundamentals of network and data security in IoT systems.
2. To learn cryptographic techniques, identity management, and access control for IoT.
3. To apply cloud and web security principles to protect IoT applications.

Course Outcomes (COs):

After completion of the course, students will be able to:

1. Explain IoT security requirements, threats, and architectural safeguards.
2. Implement cryptographic techniques and secure communication for IoT devices.
3. Design identity and access management solutions, ensuring privacy and trust in IoT networks.
4. Apply cloud and web security measures to IoT-enabled systems.

Syllabus:

UNIT I

Data & Network Security: **6 Hrs.**

Need for Security, Security Attack, Security Services, Information Security, Methods of Protection, Basics of Cryptography: Terminologies used in Cryptography, Substitution Techniques, Transposition Techniques, Network Security, Threats in Networks, Network Security Controls.

UNIT II

Introduction: Securing the Internet of Things: **7 Hrs.**

Security Requirements in IOT Architecture, Security Concerns in IOT Applications, Security Architecture in the Internet of Things, Security Requirements in IOT and challenges, Authentication and Authorization in IOT, Access Control in IOT. Attacks Specification IOT. Vulnerability and Risk in IOT, Attack and Counter measures.

UNIT III

Cryptographic Fundamentals for IOT: **6 Hrs.**

Cryptographic primitives and its role in IOT, Encryption and Decryption, Hashes, Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IOT messaging and communication protocols, IOT Node Authentication.

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UNIT IV

Identity & Access Management Solutions for IOT: **7 Hrs.**

Identity lifecycle, authentication credentials, IOT IAM infrastructure, Authorization with Publish / Subscribe schemes, access control

Privacy Preservation and Trust Models for IOT:

Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IOT, self-organizing Things, Preventing unauthorized access.

UNIT V

Cloud Security for IOT: **7 Hrs.**

Cloud services and IOT, offerings related to IoT from cloud service providers, Cloud IOT security controls, an enterprise IOT cloud security architecture, new directions in cloud enabled IoT computing.

Web Security:

Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Text Books:

1. William Stallings, "Network Security Essentials: Applications and Standards", Prentice Hall, 4th edition, 2010.
2. Madhusanka Liyanage, An Braeken, Pardeep Kumar, Mika Ylianttila, "IoT Security: Advances in Authentication", Wiley Publishers, 2019.

References:

1. Michael T. Goodrich and Roberto Tamassia, "Introduction to Computer Security", Addison Wesley, 2011.
2. Brian Russell, Drew Van Duren, "Practical Internet of Things Security", Packt Publication, 2016

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Name of Program: Bachelor of Technology in Electronics & Communication

Specialization in IOT (w.e.f. 2018)

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC723	EC	Advanced Microcontroller and Embedded Systems	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To teach programming for MSP432 using high level language such as C.
2. To teach students how a microcontroller can be used as a computer within a single integrated circuit.
3. To present the microcontrollers input/output interface capabilities for developing embedded systems with microcontrollers.
4. To illustrate how a microcontroller is a component within embedded systems controlling the interaction of the environment with system hardware and software.

Course Outcomes:

After successful completion of the course, student will be able:

1. To understand the generalized architecture of advanced microcontroller MSP432 and its programming.
2. To interface MSP432 with analog peripherals & communication systems.
3. To design an embedded system using MSP432 for a particular task.

Syllabus

UNIT I **9 Hrs**

Introduction to Microcontrollers & Embedded System

Background of Microcontrollers: Definition, Classification, Features & Applications, Architecture of Cortex M4 and its features, MSP–EXP432P401R and its Booster Packs, Energia: Development Environment, Libraries, Fundamental Programming Concepts.

Embedded System: Definition, Characteristics, Block diagram, Design Process, Case study: Weather monitoring system.

UNIT II **7 Hrs**

MSP432 Operating Parameters and Interfacing

Operating Parameters, Input Devices, Output Devices, High Power DC Interfaces, Interfacing to DC Devices, AC Devices, Educational Booster Pack Mk-II, Grove Starter Kit for LaunchPad Application.

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UNIT III **9 Hrs**

MSP432 Memory System and Power System

Memory System: Basic Memory Concepts, Memory Operations in C Using Pointers, Memory Map, Flash Memory, Direct Memory Access (DMA), External Memory: Bulk Storage with an MMC/SD Card.

Power Systems: Operating Modes and Speed of Operation, Power Supply System, Power Control Module, Operating Modes, Transition PSS and PCM Registers, Battery Operation.

UNIT IV **8 Hrs**

Time-Related Systems, Resets and Interrupts

Time-related Signal Parameters: Frequency, Period, Duty Cycle, MSP432 Clock System, Energia-related Time Functions, Watchdog Timer, Timer32, Timer A, Real-Time Clock, MSP432 Resets, Interrupts, MSP432 Interrupt System, Energia Interrupt.

UNIT V **9 Hrs**

Analog Peripherals & Communication Systems

Programming the MSP432 ADC System, Voltage Reference, Comparator, Serial Communication Concepts, MSP432 UART, Serial Peripheral Interface-SPI, Inter-Integrated Communication - I2C Module

Text Books:

1. Dung Dang, Daniel J. Pack, Steven F. Barrett, "Embedded Systems Design with the Texas Instruments MSP432 32-bit Processor" Morgan & Claypool Publisher, 2017.
2. Ying Bai, "Microcontroller Engineering with MSP432: Fundamentals and Applications" Taylor & Francis,CRC Press, 2017

References:

1. Chris Nagy, "Embedded Systems Design using the TI MSP430 Series" Newnes, 2003.
2. John H. Davies, "MSP430 Microcontroller Basics" Newnes, 2008.
3. Manuel Jiménez, Rogelio Palomera, Isidoro Couvertier, "Introduction to Embedded Systems: Using Microcontrollers and the MSP430" Springer, 2014.
4. Raj Kamal, "Embedded Systems: Architecture, Programming and Design" TMH, 2008.

List of Experiments:

1. Introduction to MSP–EXP432P401R Launch Pad, Code Composer Studio and Energia.
2. Interfacing LED using MSP432.
3. Interfacing 7-segment display to MSP432.
4. Interfacing dot-matrix display to MSP432.
5. Setting up communication interface using IR sensors.
6. Interfacing MSP432 with various sensors
7. Driving stepper motor using MSP432.
8. Interfacing memory to MSP432
9. Setting up wireless communication Network.
10. Setting up IoT link for various sensors using MSP432.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT701		Real Time Operating Systems	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The subject aims to provide the student with:
1. To understand the concepts of Operating System.
2. To obtain hands-on experience in programming Real time OS.

Course Outcomes (COs):
After completion of the course, the students will be able to:
1. Explain the operating system concepts and types of operating system.
2. Demonstrate deadlock and memory management techniques.
3. Demonstrate concepts of real-time operating system implementation

Syllabus

UNIT I **7 Hrs.**
Introduction to Operating System, Goals of an OS, Operation of an OS, Computer Architecture, Classes of Operating Systems, Structure of an Operating System, Memory Management: Single User Contiguous Scheme, Dynamic Partitions, Best-Fit Versus First-Fit Allocation, Deallocation, Paged Memory Allocation, Demand Paging, Page Replacement Policies, Segmented Memory Allocation.

UNIT II **6 Hrs.**
Process Management: Processes and programs, Implementing processes, Threads, Process Synchronization, Semaphores, Monitors, Scheduling terminology and its concepts, Deadlock: Detection, Prevention and Avoidance.

UNIT III **8 Hrs.**
Introduction to RTOS, Cortex-M Processor Architecture, ARM Cortex-M Assembly Language, Pointers in C, Memory Management, MSP432 I/O programming, Interrupts, First in First Out (FIFO) Queues, Edge-triggered Interrupts, UART Interface, Basic principles of Input Capture, Pulse Width modulation on MSP432, OS Considerations for I/O Devices, Debugging.

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UNIT IV **7 Hrs.**

Thread Management: Parallel, distributed and concurrent programming, Introduction to threads, States of a main thread, Two types of threads, Thread Control Block, Creation of threads, Switching threads, Profiling the OS, Semaphores, Thread Synchronization, Process Management, Dynamic loading and linking

UNIT V **6 Hrs.**

Time Management: Cooperation, Blocking semaphores, First in First out Queue, Thread Sleeping, Deadlocks, Monitors, Fixed Scheduling.

Real-time Systems: Data Acquisition Systems, Priority scheduler, Debouncing a switch, Texas Instruments RTOS, FreeRTOS.

Text Books:

1. Dhananjay M. Dhamdhere, "Operating Systems: A Concept-Based Approach", McGraw Hill Education; Third Edition, 2017.
2. Ann Mciver Mchoes, Ida M. Flynn, "Understanding Operating Systems"., Cengage Learning Sixth Edition.
3. Jonathan W. Valvano, "Real-Time Operating Systems for ARM Cortex-M Microcontrollers", Volume 3, Fourth Edition, 2017.

References:

1. Rob Williams, "Real Time Systems Development"., First Edition, Elsevier 2006.
2. Phillip A. Laplante, Seppo J. Ovaska, "Real Time Systems Design and Analysis: Tools for the Practitioner", Fourth Edition IEEE Press, 2012.
3. Andrew S. Tanenbaum, Herbert Bos "Modern Operating Systems", Pearson, Fourth Edition, 2012

List of Experiments:

1. To develop the process of scheduling algorithms.
2. Study and Installation of TINY OS.
3. Creation of tasks and task communication using TINY OS.
4. Task pending and deletion from TINY OS.
5. Task Suspension in TINY OS.
6. Understand DEADLOCK in TINY OS.
7. Porting TINY OS on microcontroller.
8. Traffic light controller using TINY OS.

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Name of Program: Bachelor of Technology in Robotics and Automation w.e.f. 2021

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA601	EC	Advanced Control Systems	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The course will provide understanding of linear and nonlinear control systems. Students will understand the Conventional and Intelligent Control Systems.

Course Outcomes (COs):
After the successful completion of this course students will be able to

1. Develop of state models for linear continuous – time and discrete – time systems.
2. Demonstrate non-linear system behavior by phase plane and describing function methods.
3. Design pole assignment and state observer using state feedback.
4. Develop the describing function for the nonlinearity present to assess the stability of the system.
5. Develop Lyapunov function for the stability analysis of nonlinear systems.
6. Study the design of optimal controller.

UNIT I **9 Hrs.**
Introduction to Control
Review of Linear Control System: Modeling through differential equations and difference equations, state space method of description and its solution, discretization of continuous time, state space model, Laplace and z-domain analyses of control systems, PID Controller, Controllability, Observability & Stability, Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT II **8 Hrs.**
State Variable Design
Introduction to state Model, effect of state Feedback, Necessary and Sufficient Condition for Arbitrary Pole-placement, pole placement Design, design of state Observers, separation principle, servo design, State Feedback with integral control.

UNIT III **9 Hrs.**
Phase Plane Analysis
Features of linear and non-linear systems, Common physical non-linearities, Methods of linearization, Concept of phase portraits, Singular points, Limit cycles, Construction of phase portraits, Phase plane analysis of linear and non-linear systems, Isocline method.

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UNIT IV **8 Hrs.**

Control of Nonlinear Dynamics

Lyapunov's Stability Theorems, Lyapunovs Method for Linear Time Invariant Systems, Stability of Nonlinear Systems by Method of Lyapunov, Krasovskii's Theorem on Lyapunov Function, Application of Lyapunov Function to Estimate Transients.

UNIT V **9 Hrs.**

Optimal Control

Formulation of the Optimal Control Problem, Optimal Control System Design Using Second Method of Lyapunov, Calculus of variation, Euler-Lagrange equations, Boundary conditions, Transversal condition Bolza problem, Pontyazin's maximum principle.

Text Books:

1. M. Gopal, "Modern Control System Theory", New Age International Publishers, 2002.
2. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
3. G. J. Thaler, "Automatic Control Systems", Jaico Publishing House, 2000.

References:

1. K. Ogata, "Modern Control Engineering", 4th edition, PHI, New Delhi, 2002.
2. B.S. Manke, "Advanced Control System", Khanna Publication.
3. D.S. Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.
4. M. Gopal, "Digital Control and State Variable Methods: Conventional and Intelligent Control Systems", McGraw Hill 4th Edition, 2012

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT721		Energy Harvesting for IOT Devices	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
To learn the Energy Harvesting principles and methodologies for IOT Devices.

Course Outcomes (COs):
After the completion of this course, the student should be able to:
1. Ability to understand the power requirements for IOT Devices.
2. Understand the various energy harvesting techniques.
3. Design Harvested Power Supply for the IOT Devices.

Syllabus

UNIT I **8 Hrs.**
Introduction: Energy requirements of Autonomous Devices, Enabling Technologies: Devices and Peripheral, Power requirement in communication protocols, Energy-awareness in Embedded Software.

UNIT II **9 Hrs.**
Photovoltaic Energy Harvesting: Semiconductor basics, Solar cell and module characteristics, Irradiance standards, efficiency losses, photovoltaic device technologies, complete photovoltaic systems.

UNIT III **9 Hrs.**
Kinetic Energy Harvesting: Introduction, Kinetic energy, Harvesting Applications, Inertial generators, Transduction mechanism- Piezoelectric generator, Electromagnetic Transduction, Electrostatic generators, micro scale Implementations, rotary generators.

UNIT IV **8 Hrs.**
Thermoelectric Energy Harvesting: Introduction, principles of Thermoelectric devices, Seeback effect, Peltier effect, Thomson effect, structure of thermoelectric device and its power output and conversion efficiency, capabilities of Thermoelectric devices.

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UNIT V **8 Hrs.**

Power Management Electronics: Interface Circuit impedance Matching, energy storage, voltage regulation, interface electronics for Kinetic energy harvesters, thermal and Solar Harvesters, Energy storage interface.

Case studies- commercial Vibration energy harvester, self-power wireless sensor

Text Books:

1. Stephen Beeby, Neil White, "Energy Harvesting for Autonomous Systems", Artech House Series, 2010.
2. Jahangir Rastegar, Harbans S. Dhadwal, "Energy Harvesting for low-Power Autonomous Devices and Systems", SPIE Press, 2016

References:

1. Mohammad Alhawari, Baker Mohammad Hani Saleh, Mohammed Ismail, "Energy Harvesting for Self-Powered Wearable Devices", Springer, 2018
2. Tom J. Kazmierski, Steve Beeby, "Energy Harvesting Systems: Principles, Modeling and Applications", Springer, 2011
3. Shashank Priya, Daniel J. Inman, "Energy Harvesting Technologies" , Springer 2009

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT703	EC	Wireless Sensor Networks	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
This course discusses protocols and architectures for wireless sensor network design. It covers wireless sensor node and network architectures, and communication protocols in different layers. The course focuses on topics for wireless sensor networks such as time synchronization, localization, and topology management.

Course Outcomes (COs):
After the completion of this course, the student should be able to:
1. Elaborate various applications of wireless sensor networks,
2. Describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks, and
3. Propose, implement, and evaluate new ideas for solving wireless sensor network design issues.

Syllabus

UNIT I **6 Hrs.**
Introduction: Definition, challenges and constraints of Wireless Sensor Networks (WSN), Advantages of Sensor Networks, Applications of Sensor Networks, Enabling technologies for WSN, Operating systems and execution environments.

UNIT II **7 Hrs.**
Node architecture: Sensor Node Technology, sensing subsystem, processor subsystem-architectural overview, communication interfaces. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints.

UNIT III **7 Hrs.**
Deployment and Configuration: Localization and positioning, different types of localization, Coverage and connectivity, Single-hop and multihop localization, self-configuring localization systems, sensor management, ranging techniques.

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UNIT IV **7 Hrs.**

Routing protocols: Classification of routing protocols, Routing Challenges and Design issues in WSN, Routing Strategies in WSN, Data Dissemination and Gathering, Concepts of Flooding, Directed Diffusion, Negotiation and Clustering Hierarchy.

UNIT V **7 Hrs.**

Data Storage and Manipulation: Data centric and content-based routing, Energy-efficient routing, Geographical routing. Storage and retrieval in network, compression technologies for WSN, data aggregation techniques. Security attacks in wireless sensor networks.

Text Books:

1. Kazem, Sohraby, Daniel Minoli, Taieb Zanti, "Wireless Sensor Network: Technology, Protocols and Application", John Wiley and Sons 1st Ed., 2007.
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory & Practice", John Wiley and Sons, 2010.

References:

1. Holger Kerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", John Wiley and Sons, 2005.
2. Books on Demand, *Wireless Sensor Networks: Design, Deployment and Applications*, 2021.
3. Feng Zhao, Leonidas Guibas, "Wireless Sensor Network", Elsevier, 1st Ed. 2004.
4. B. Krishnamachari, "Networking Wireless Sensors", Cambridge University Press, 2005
5. Edla, Kongara, Lipare, and Kuppili, *Wireless Sensor Networks: Evolutionary Algorithms for Optimizing Performance*, CRC Press, 2021.

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COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC703		**System Verilog based Design and Verification Lab**	0	0	0	30	20	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The goal of the course is to familiarize the students with various design and verification methods based on Verilog.

Prerequisites: Digital Logic Design.

Course Outcomes (COs):
At the end of the course the student will be able to
1. Understand the concepts of verification methodologies and data types.
2. Summarize the concepts of procedural statements, routines and assertions.
3. Illustrate the concepts of OOP terminology.
4. Demonstrate the randomization in System Verilog.
5. Analyze the concepts of functional coverage.

List of Experiments:

1. Design of combinational circuits using system Verilog.
2. Design of sequential circuits using system Verilog.
3. Design of FSM using system Verilog.
4. Understanding the basics of verification.
5. Understanding the concept of OOPS in system Verilog.
6. Understanding Inter-process communication using event, semaphore and mailbox.
7. Understanding the Transaction class in system Verilog.
8. Understanding the Generator Class in System Verilog.
9. Understanding the Driver Class in System Verilog.
10. Understanding the Monitor class in System Verilog.
11. Understanding the score board in System Verilog.
12. Develop a project for FIFO verification.

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