ShriVaishnavVidyapeethVishwavidyalaya

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*				
BTECIOT702	EC	**Security in IOT**	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 following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
To learn the security principles and methodologies for Internet of Things.

Course Outcomes:
The students will be able to
1. Understand the Security requirements in IOT.
2. Understand the cryptographic fundamentals for IOT.
3. Understand the authentication credentials and access control.
4. Understand the various types Trust models and Cloud Security.

Syllabus:

UNIT I

Data & Network Security: **8 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: **9 Hrs.**
Security Requirements in IOT Architecture, Security in Enabling Technologies, 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, Threats to Access Control, Privacy, and Availability. Attacks Specification IOT. Vulnerability and Risk in IOT, Attack and Counter measures.

UNIT III

Cryptographic Fundamentals for IOT: **8 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: **9 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 **9 Hrs.**

Cloud Security for IOT:

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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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS701	-	Cloud Computing	3	0	2	4	60	20	20	30	20

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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COURSE OBJECTIVES

The student will have ability to:

1. Analyze the SAAS, PAAS IAAS services of Cloud Computing to represent how engineering agility inan organization can be created.
2. Assess the exploitation of web services from cloud computing.
3. Configure essential infrastructural components used for implementing Cloud.
4. Significantly study case studies to derive the most excellent practice model to be appropriate when deploying cloud based applications.

COURSE OUTCOMES

Upon completion of the subject, students will be able to:

1. Investigate the trade-offs among deploying applications in the cloud and over the local infrastructure.
2. Compute the real-world problems security, privacy issues using cloud computing through group collaboration.
3. Development and Deployment applications over commercial cloud computing infrastructures.
4. Analyze and investigation of application & hardware performance, scalability, and availability of the underlying cloud technologies and software.

SYLLABUS

UNIT–I: Overview of Cloud Computing

Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT–II :Cloud Computing Technology-

Client systems, Networks, server systems andsecurity from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT–III: Working with Cloud

Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities.Software as a Service –conceptual model and working.Trends in Service provisioning with clouds.Working on Microsoft Azure & IBM Smart Cloud.

UNIT–IV: Using Cloud Services-

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Cloud collaborative applications and services – case studieswith calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT–V:Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,-Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. Cloud Computing: A Practical Approach by Anthony T. Velte Toby J. Velte, RobertElsenpeter, 2010 by The McGraw-Hill.
2. Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub.
3. Michael Miller, Cloud computing – Web based Applications, Pearson Publishing, 2011

REFERENCES:

1. Kumar Saurabh, "Cloud Computing", Wiley Pub,2012.
2. Krutz , Vines, "Cloud Security , Wiley Pub,2013.
3. Sosinsky, " Cloud Computing", Wiley Pub,2012.
4. Murray Woodside; John Chinneck ; Marin Litiou on "Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness"IEEEXplore, Year: 2017, Page(s):277 – 290.

LIST OF EXPERIMENTS:

1. Service deployment & Usage over cloud using Virtual Box.
2. Performance evaluation of services over cloud using VMware tool.
3. Working of Goggle Drive to make spreadsheet.
4. Working on Herokufor Cloud application deployment.
5. Working on Anekasevices for Cloud application.
6. Working on services of Google App Engine.
7. Working on Application deployment & services of Microsoft Azure.
8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Euceliptus.
10. Deployment &Services of Amazon Web Services.

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			THEORY			PRACTICAL					
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BTEC702	EC	Advanced Communication Systems	60	20	20	30	20	3	0	2	4

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Course Objectives:

1. To develop an understanding of OFDM and MIMO systems.
2. To enable the students to differentiate between various type of receiver and fading characteristics.
3. To provide the knowledge of cognitive and cooperative systems.

Course Outcomes:

The student will be able to:

1. Analyze MIMO and OFDM systems and design systems with different fading channels.
2. Understand the concepts of 5G and its technologies
3. Analyze the concept of cognitive and cooperative communication systems.

Syllabus:

UNIT I **8 Hrs.**

Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, Code division multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

UNIT II **8 Hrs.**

Smart antennas, multiple input multiple output systems, spatial multiplexing, multi user MIMO, transmitter diversity, receiver diversity, Channel state information, MIMO System Model, Zero Forcing Receiver, MMSE receiver, Singular Value Decomposition of MIMO Channel, MIMO capacity, Asymptotic MIMO Capacity, Alamouti and Space-time codes.

UNIT III **9 Hrs.**

Introduction to 5G, 5G Requirements, 5G Technology, Massive MIMO and its advantages and challenges, Homogeneous and Heterogeneous Network Scenarios, Millimetre Communication Technology, millimetre wave Propagation characteristics and beamforming, Filter bank multi-carriers (FBMC) and Universal filtered multi-carrier (UFMC).

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UNIT IV **8 Hrs**

Introduction and motivation for Cooperative Communication, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

UNIT V **9 Hrs**

Cognitive Radios, Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay. Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection and other approaches, Spectrum Sharing Models of Dynamic Spectrum Access – Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

Text Books:

1. David Tse, Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2011.
2. Aditya K. Jagannatham, "Principles of Modern Wireless Communication System", McGraw Hill, 1st Edition, 2017
3. Molisch, "Wireless Communications", Wiley India, 2nd Edition , 2013.
4.

References:

1. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd, 3rd Edition 2011.
2. Marvin K. Simon, Mohamed-Slim Alouini, "'Digital Communication over Fading Channels", Wiley-IEEE Press, 2nd Edition., 2004.
3. Long Zhao, Hui Zhao, Kan Zheng and Wei Xiang, "Massive MIMO in 5G Networks: Selected Applications", Springer.

List of Experiments:

1. To study SIMULINK.
2. To study BerTool.
3. To implement SIMULINK model for BPSK
4. To implement SIMULINK model for QPSK
5. Implementation of CDMA
6. Implementation of orthogonal frequency division multiple access
7. To calculate the bit error rate for OFDM system.
8. Channel capacity of MIMO systems in Wireless communication.
9. Energy detection simulation for cognitive radio.
10. Water filling model in a MIMO system.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	T	P	CREDITS
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;
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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	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	T	P	CREDITS
BTECIOT701	EC	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;
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Course Objectives:-

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:-
After completion of the course student will be able
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 **9 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 **8 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 **9 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 **8 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 **9 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 scheduling algorithm.
2. 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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SUBJECT CODE	Cat-egory	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	T	P	CREDITS
BTECIOT711	EC	Principles of Artificial Intelligence and Machine Learning	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):
The student will have ability to:
1. Know how to build simple knowledge-based systems.
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
3. Ability to apply knowledge representation, reasoning, and machine learning techniques to real world problems.

Course Outcomes (COs):
Upon completion of the subject, students will be able to:
1. Describe the key components of the artificial intelligence (AI) field.
2. Identify and describe artificial intelligence techniques, including search heuristics, knowledge representation, automated planning and agent systems, machine learning, and probabilistic reasoning.
3. Identify and apply AI techniques to a wide range of problems, including complex problem solving via search, knowledge-base systems, machine learning, probabilistic models, agent decision making.
4. Analyze and understand the machine learning and various algorithms

Syllabus

UNIT-I **10 Hrs.**

Introduction To Al And Production Systems

Introduction to AI-Problem formulation, Problem Definition Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics, Specialized production system, Problem solving methods, Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction, Related algorithms, Measure of performance and analysis of search algorithms.

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UNIT-II **8 Hrs.**

Representation of knowledge

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation. Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT-III **8 Hrs.**

Knowledge inference

Knowledge Inference -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory Bayesian Network-Dempster - Shafer theory.

UNIT-IV **10 Hrs.**

Machine Learning (ML)

Types of ML, Supervised ML. Unsupervised ML, Semi Supervised ML. Reinforecent ML. Regression Algorithms: Simple Linear Regression, Multiple Regression, Polynomial Regression, Support Vector Regression SVR, Decision Tree Regression, Random Forest Regression, Metrics evaluation of Regression

UNIT-V **9 Hrs.**

Classification of Algorithms

Supervised ML; Classification Algorithms: Logistic Regression, K Nearest Neighbours, Support Vector Machine(SVM), Kernel SVM, Decision Trees Classification, Random Forest Classification, Ensemble Techniques, Semi-supervised learning with EM using labeled and unlabeled data, Overfitting and Underfitting, Unsupervised Learning, Dimension reductionality PCA and LDA, clustering and Association algorithm.

Text books:

1. Rich E and Knight K, "Artificial Intelligence", Third Edition, TMH, 2017.
2. Nelsson N.J., "Principles of Artificial Intelligence", First Edition, Springer Verlag, Berlin.
3. Oliver Theobald ,"Machine Learning For Absolute Beginners: A Plain English Introduction" , 2nd Edition , 2017

References:

1. S.Rajasekaran and G.A. VijayalaksmiPai "Neural Network, Fuzzy Logic, and Genetic Algorithm Synthesis and Applications", Second Edition, Prentice Hall, 2017
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall,. 2002
3. Ethem Alpaydin, "Introduction to Machine Learning", Second Edition, The MIT Press, 2010
4. Barr A, Fergenbaub E.A. and Cohen PR, "Artificial Intelligence", Addison Wesley,
5. Kos Ko B, "Neural Networks and Fuzzy system" Prentice Hall India Learning Private Limited.

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<tr><th rowspan="3">SUBJECT CODE</th><th rowspan="3">Cate-gory</th><th rowspan="3">SUBJECT NAME</th><th colspan="9">TEACHING & EVALUATION SCHEME</th></tr>
<tr><th colspan="3">THEORY</th><th colspan="2">PRACTICAL</th><th rowspan="2">L</th><th rowspan="2">T</th><th rowspan="2">P</th><th rowspan="2">CREDITS</th></tr>
<tr><th>END SEM University Exam</th><th>Two Term Exam</th><th>Teachers Assessment*</th><th>END SEM University Exam</th><th>Teachers Assessment*</th></tr>
<tr><td>BTECIOT721</td><td>EC</td><td>Energy Harvesting for IOT devices</td><td>60</td><td>20</td><td>20</td><td>0</td><td>0</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
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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.

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UNIT-IV **9 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.

UNIT-V **10 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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Name of Program: B.Tech. in Electronics and Communication with Specialization in IOT (w.e.f 2018)

SUBJECT CODE	Cate-gory	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	0	0	3

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):
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. List 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 **9 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 **9 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 **8 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 **9 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 **9 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 (ISBN: 978-0-471-74300-2).
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory & Practice", John Wiley and Sons, (ISBN: 978-81-265-5125-5).

References:

1. Holger Kerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9)
2. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, "Wireless Sensor Network", Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).
3. Feng Zhao, Leonidas Guibas, " Wireless Sensor Network",Elsevier, 1st Ed. 2004 (ISBN: 13- 978-1-55860-914-3)
4. B. Krishnamachari, "Networking Wireless Sensors", Cambridge University Press.
5. N. P. Mahalik, "Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications" Springer Verlag.

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BBA Hons.-V SEMESTER (20-23)

BBAI501 HUMAN VALUES AND PROFESSIONAL ETHICS

<table>
<tr><th rowspan="3">SUBJECT CODE</th><th rowspan="3">SUBJECT NAME</th><th colspan="9">TEACHING & EVALUATION SCHEME</th></tr>
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<tr><th>END SEM University Exam</th><th>Two Term Exam</th><th>Teachers Assessment*</th><th>END SEM University Exam</th><th>Teachers Assessment*</th></tr>
<tr><td>BBAI501</td><td>Human Values and Professional Ethics</td><td>60</td><td>20</td><td>20</td><td>-</td><td>-</td><td>4</td><td>-</td><td>-</td><td>4</td></tr>
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Course Objective
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

Examination Scheme
The internal assessment of the students' performance will be done out of 40 Marks. The semester Examination will be worth 60 Marks. The question paper and semester exam will consist of two sections A and B. Section A will carry 36 Marks and consist of 5 questions, out of which student will be required to attempt any three questions. Section B will comprise of one or more cases / problems worth 24 marks.

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, Need for Human Values, Sources of Values

2. Essence of Values
3. Classification of Values (Temporal Values, Universal Values, Instrumental Values, Terminal Values)
4. Values Across Culture

Unit II: Morality

1. Morality its meaning and definition
2. Values Vs Ethics Vs Morality
3. Concept of Impression Management
4. Impression Management Strategies (Intimidation, Ingratiation, Self-promotion, Supplication, Exemplification)

Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Pre-requisites of Leadership
2. Approaches to Leadership, Leadership Styles
3. Ethical Leadership
4. Values in Leadership

Unit IV: Business Ethics

1. Business Ethics its meaning and definition
2. Relevance of Ethics in Business organizations.
3. Theories of Ethics (Teleological, Deontological)
4. Code of Ethics

Unit V: Globalization and Ethics

1. Globalization and Business Changes
2. Values for Global Managers
3. Corporate Social Responsibility
4. Benefits of Managing Ethics in Work Place.

Suggested Readings

1. Kaur, T. (2004). ***Values and Ethics in Management.*** Galgotia Publishing Company: New Delhi
2. Kaushal, S.L. (2006). ***Business Ethics. Concepts, Crisis and Solutions.*** Deep & Deep Publications Pvt. Ltd.: New Delhi
3. Beteille, Andre (1991). ***Society and Politics in India***. AthlonePress: New Jersey.
4. Chakraborty, S. K. (1999). ***Values and Ethics for Organizations***. Oxford University Press
5. Fernando, A.C. (2009). ***Business Ethics - An Indian Perspective*** .India: Pearson Education: India

6. Fleddermann, C. D. (2012). ***Engineering Ethics***. New Jersey: Pearson Education / Prentice Hall.

7. Boatright, J.R. (2012). ***Ethics and the Conduct of Business.*** Pearson. Education: New Delhi.

8. Crane, A.and Matten, D. (2015). ***Business Ethics***. Oxford University Press Inc:New York.

9. Murthy, C.S.V. (2016). Business ***Ethics – Text and Cases***. Himalaya Publishing House Pvt. Ltd:Mumbai

10. Naagrajan, R.R (2016). ***Professional Ethics and Human Values***. New Age International Publications: New Delhi.

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BTECIOT704	EC	Android Application Development for IOT	0	0	0	30	20	0	0	2	1

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Syllabus
Create and deploy Android applications.

Experiment List

E.N.	Aim
1.	Installation of eclipse and Android Studio.
2.	Develop an application that uses GUI components, Font and Colours.
3.	Develop an application that uses Layout Managers and event listeners.
4.	Write an application that draws basic graphical primitives on the screen.
5.	Develop an application to implement a login window using UI controls.
6.	Develop an application that makes use of databases.
7.	Develop an application that makes use of Notification Manager.
8.	Implement an application that uses Multi-threading.
9.	Develop a native application that uses GPS location information.
10.	Implement an application that creates an alert upon receiving a message.
11.	Develop a mobile application to send an email.

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