

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY,
LUCKNOW, UTTAR PRADESH**



**EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. 4TH YEAR**

Computer Science and Engineering (IoT)

Based On

NEP2020

(Effective from the Session: 2025-26)

B. TECH (COMPUTER SCIENCE AND ENGINEERING (IoT))
CURRICULUM STRUCTURE

SEMESTER- VII														
Sl. No.	Subject Code	Subject	Learning Mode	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BCIT701	Cryptography and Network Security	Offline	3	-	-	20	10	30		70		100	3
2	B**07*	Dept- Elective-IV	Offline	3	-	-	20	10	30		70		100	3
3	BOEM**	Open Elective-II	MOOC's	3	0	0	20	10	30		70		100	3
4	BCIT751	Cryptography and Network Security LAB	Offline	0	0	2				50		50	100	1
5	BCS752	Mini Projects or Internship Assessment*		0	0	4	-	-	-	100	-	-	100	2
6	BCS753	Project-1		0	0	10				150		-	150	5
7	BCS754	Startup and Entrepreneurial Activity Assessment#		0	0	4				100			100	2
Total				9	0	20							750	19

*The Mini Project or internship (5-6 weeks) conducted during summer break after VI semester will be assessed during VII semester.
#The Startup and Entrepreneurial Activity Assessment will be done in the 7th semester, under which a student will have to undergo a startup/entrepreneurship activity of at least 60 hours till the 6th semester

SEMESTER- VII														
Sl. No.	Subject Code	Subject	Learning Mode	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BOENM**	Open Elective-III	MOOC'S	3	0	0	20	10	30		70		100	3
2	BOENM**	Open Elective-IV	MOOC'S	3	0	0	20	10	30		70		100	3
4	BCS851	Project-II		0	0	18				100		350	450	10
Total				6	0	18							650	16

The Internal Assessment of MOOCs will be done by the respective institute, and the External Assessment (End Semester Examination) will be done by the University.

Departmental Elective-IV

1. BCS070- Internet of Things
2. BCS071- Cloud Computing
3. BCIT070- Drone Technology
4. BCS073- Design and Development of Applications

B. TECH (COMPUTER SCIENCE AND ENGINEERING (IoT))
SEVENTH SEMESTER (DETAILED SYLLABUS)

BCIT701

Cryptography & Network Security

**Bloom's
Knowledge
Level (KL)**

Course Outcome (CO)

CO 1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques.	K ₂ , K ₃
CO 2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	K ₁ , K ₂
CO 3	Understand vulnerability assessments and the weakness of using passwords for authentication	K ₄
CO 4	Be able to perform simple vulnerability assessments and password audits	K ₃
CO 5	Summarize the intrusion detection and its solutions to overcome the attacks.	K ₆

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	Introduction to security attacks, services and mechanism, Classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	08
II	Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA	08
III	Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA) Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,	08
IV	Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.	08
V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls	08

Text books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 2020.
2. Behrouz A. Frouzan, "Cryptography and Network Security", McGraw Hill, 2015.
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan, "Cryptography and Security", Wiley, 2011
4. Bruce Schiener, "Applied Cryptography", Wiley, 2015.
5. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, 2010.
6. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 2020.

BCS070**Internet of Things****Course Outcome (CO)****Bloom's Knowledge Level (KL)****At the end of course, the student will be able to understand**

CO 1	Demonstrate basic concepts, principles and challenges in IoT.	K1,K2
CO 2	Illustrate functioning of hardware devices and sensors used for IoT.	K2
CO 3	Analyze network communication aspects and protocols used in IoT.	K4
CO 4	Apply IoT for developing real life applications using Arduino programming.	K3
CP 5	To develop IoT infrastructure for popular applications	K2, K3

DETAILED SYLLABUS**3-1-0**

Unit	Topic	Proposed Lecture
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability	08
II	Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	08
III	Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	08
IV	Programming the Arduino: Arduino Platform Boards Anatomy, Arduino IDE, coding, using emulator, using libraries, additions in arduino, programming the arduino for IoT.	08
V	Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	08

Text books:

1. Olivier Hersistent, David Boswarthick, Omar Elloumi “The Internet of Things key applications and protocols”, Wiley, 2012.
2. Jeeva Jose, “Internet of Things”, Khanna Publishing House, 2018.
3. Michael Miller “The Internet of Things” by Pearson, 2015.
4. Raj Kamal, “Internet of Things: Architecture and Design Principles”, McGraw-Hill, 2nd Edition, 2017.
5. Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-On Approach”, 1ST edition, VPI publications, 2014
6. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things” Wiley, 2015.

BCS071**Cloud Computing**

Course Outcome (CO)	Bloom's Knowledge Level (KL)
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At the end of course , the student will be able to understand

CO 1	Describe architecture and underlying principles of cloud computing.	K ₃
CO 2	Explain need, types and tools of Virtualization for cloud.	K ₃ , K ₄
CO 3	Describe Services Oriented Architecture and various types of cloud services.	K ₂ , K ₃
CO 4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.	K ₂ , K ₄
CO 5	Analyze advanced cloud technologies.	K ₃

DETAILED SYLLABUS**3-0-0**

Unit	Topic	Proposed Lecture
I	Introduction To Cloud Computing: Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On- demand Provisioning.	08
II	Cloud Enabling Technologies Service Oriented Architecture: REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.	08
III	Cloud Architecture, Services And Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	08
IV	Resource Management And Security In Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	08
V	Cloud Technologies And Advancements Hadoop: MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	08

Text books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", Tata Mcgraw Hill, 2009.
5. George Reese, " Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly, 2009.

BCIT070**Drone Technology****Bloom's Knowledge Level (KL)****Course Outcome (CO)****At the end of course, the student will be able to**

CO 1	Apply the concept of Flight dynamics for building Quadcopter	K ₁ , K ₂
CO 2	Assemble and Program the Quadcopter	K ₃
CO 3	Perform Testing and Control operations on the Quadcopter	K ₃ , K ₄
CO 4	Implement Quadcopter for real world applications	K ₄
CO5	Design and Develop the Drone	K ₃ , K ₄

DETAILED SYLLABUS**3-0-0**

Unit	Topic	Proposed Lecture
I	Flight Dynamics of Aerial Vehicles Definitions of Drone, UAV, RPA, Quad copters -Basic Components and Categories – Principles of Flight - Flight Maneuvers – Airframes - Creating a Frame: Materials, Different Frame Shapes – Building Airframes - Flight dynamics - Applications - Future potential - Comparison with other aerial vehicles	08
II	Hardware Anatomy of Quadcopter Power Train – Propellers, Motors- Total Lift - Electronic Speed Controllers – Flight Battery – Radio transmitter and receiver – Flight Controller – GPS, Compass, Camera Assembling for Quad copter – Connectors, Mounting of Propellers and Powering up.	08
III	Testing And Maintenance of Quadcopter Key Flight Safety Rules - Preflight Checklist and Flight Log Information – Flight Instructions - Repair and Maintenance: Crash analysis, Common issues, Voltage testing. Test and troubleshoot Flight Controller Board (FCB), Electronic Speed Controller (ESC), and its associated peripherals.	08
IV	Perform programming and configure the flight control board (FCB). Identify, explore, and test the interconnectivity of different peripherals with FCB. Establish connection of FCB with motor, GPS, ESC, and sensors. Configure, test, and record FCB with battery to monitor battery level and perform return to home operation Perform and carry out drone leveling using IMU sensor. Perform calibration of the compass, Lidar, and gyro sensor. The test communication link between FCB and RF transceiver. Write and upload computer code to FCB to test sensor results. Test and record data of motor connectivity with ESC. Perform motor rotation using FCB and ESC. Test signal flow into the drone to test ESC parameters on FCB to check its operation. Write and upload computer code to FCB to ESC working.	08
V	Real World Applications and Case Studies Beneficial Drones, Aerial Photography, Mapping and Surveying, Precision Agriculture, Search and Rescue, Infrastructure Inspection, and Conservation. Case Studies: Agriculture Weed Classification, Microdrone surveillances.	08

Text books:

1. Reg Austin “Unmanned Aircraft Systems UAV design, development and deployment”, Wiley, 2010.
2. Robert C. Nelson, “Flight Stability and Automatic Control”, McGraw-Hill, Inc, 1998.
3. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007.
4. Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998.
5. A. J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics Company, 2001.

BCS073**Design and Development of Applications**

Course Outcome (CO)	Bloom's Knowledge Level (KL)
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At the end of the course, the student will be able to

CO 1	Be exposed to technology and business trends impacting mobile applications	K ₁ , K ₂
CO 2	Be competent with the characterization and architecture of mobile applications.	K ₃
CO 3	Be competent with understanding enterprise scale requirements of mobile applications.	K ₁ , K ₂
CO 4	Be competent with designing and developing mobile applications using one application development framework.	K ₄
CO 5	Be exposed to Android and iOS platforms to develop the mobile applications	K ₅

DETAILED SYLLABUS**3-0-0**

Unit	Topic	Proposed Lecture
I	INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	08
II	BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability	08
III	ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	08
IV	TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-Fi – Integration with social media applications.	08
V	TECHNOLOGY II –iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift	08

Text books:

1. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
2. A. Pradhan and A. V. Deshpande, "Composing Mobile Apps: Learn | Explore | Apply using Android", 1st ed. Wiley India, 2014.
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012.
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
5. D. Mark, J. Nutting, J. LaMarche, and F. Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", 1st ed. Apress, 2013.

BCIT751 CRYPTOGRAPHY and NETWORK SECURITY LAB

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Explain security concepts, Ethics in Network Security. Identify and classify various attacks and explain the same.	K ₃
CO 2	Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.	K ₄ , K ₅
CO 3	Comprehend and apply authentication, email security, web security services and mechanisms.	K ₄
CO 4	Distinguish and explain different protocol like SSL, TLS Vis-à-vis their applications	K ₂
CO 5	Explain the role of third-party agents in the provision of authentication services.	K ₄ , K ₅

DETAILED SYLLABUS

1. Write a C program that contains a string(char pointer) with a value 'Hello World'. The programs should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms: a. Ceaser Cipher b. Substitution Cipher c. Hill Cipher.
4. Write a Java program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. 1) Write the RC4 logic in Java Using Java Cryptography, encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool. 2) Write a Java program to implement RSA Algorithm.
8. 1. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. 2. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
9. Calculate the message digest of a text using the MD5 algorithm in JAVA.
10. Write a java program for Knapsack using Dynamic Programming based solution.

Note: The Instructor may add/delete/modify/tune experiments

BCS752**Mini Project or Internship Assessment****Course Outcome (CO)****Bloom's Knowledge Level (KL)****At the end of the course, the student will be able to understand**

CO 1	Developing a technical artefact requires new technical skills and effectively utilizing a new software tool to complete a task	K ₅
CO 2	Writing requirements documentation, selecting appropriate technologies, identifying and creating appropriate test cases for systems.	K ₆
CO 3	Demonstrating understanding of professional customs & practices and working with professional standards.	K ₅
CO 4	Improving problem-solving, critical thinking skills and report writing.	K ₅
CO 5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, and developing appropriate workplace attitudes.	K ₄

BCS753/ BCS851**Project****Course Outcome (CO)****Bloom's Knowledge Level (KL)****At the end of the course, the student will be able to understand**

CO 1	Analyse and understand the real-life problem and apply their knowledge to get a programming solution.	K ₅
CO 2	Engage in the creative design process through the integration and application of diverse technical knowledge and expertise to meet customer needs and address social issues.	K ₅
CO 3	Use the various tools and techniques, coding practices for developing real real-life solution to the problem.	K ₆
CO 4	Find out the errors in software solutions and establish the process to design maintainable software applications	K ₅
CO 5	Write the report about what they are doing in the project and learning the team working skills	K ₆