

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



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

Computer Science and Business Systems

Based On

NEP2020

(Effective from the Session: 2025-26)

B. TECH (COMPUTER SCIENCE AND BUSINESS SYSTEMS) 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*	Department Elective-IV	Offline	3	-	-	20	10	30		70		100	3
3	BOEM**	Open Elective-II	MOOCs/ Offline	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	BCBS752	Mini Projects or Internship Assessment*		0	0	4	-	-	-	100	-	-	100	2
6	BCBS753	Project-1		0	0	10				150		-	150	5
7	BCBS754	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 and will be assessed during VII semester.
 #The Startup and Entrepreneurial Activity Assessment will be done in 7th semester under which a student will have to undergo a startup/entrepreneurship activity of at least 60 hours till 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	MOOCs	3	0	0	20	10	30		70		100	3
2	BOENM**	Open Elective-IV	MOOCs	3	0	0	20	10	30		70		100	3
4	BCBS851	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. BCBS070- Introduction to Business Analytics & Data Science
4. BCS073- Design and Development of Applications

B. TECH (COMPUTER SCIENCE AND BUSINESS SYSTEMS)
SEVENTH SEMESTER (DETAILED SYLLABUS)

BCIT701		Cryptography & Network Security	
Course Outcome (CO)		Bloom's Knowledge Level (KL)	
At the end of course, the student will be able:			
CO 1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques.	K ₂	
CO 2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	K ₂	
CO 3	Understand vulnerability assessments and the weakness of using passwords for authentication	K ₁	
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 ₂	
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: Principals 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.Padmabhan, "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:		
CO1	Explain the basic concepts, principles and challenges in IoT.	K2
CO2	Illustrate functioning of hardware devices and sensors used for IoT.	K2
CO3	Describe the network communication aspects and protocols used in IoT.	K2
CO4	Apply IoT for developing real life applications using Arduino programming.	K3
CO5	Apply the knowledge of IoT infrastructure for popular applications	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, Net Arduino, 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 Hersent, 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. ArshdeepBahga, Vijay Madiseti, “Internet of Things: A Hands-On Approach”, 1ST edition, VPI publications, 2014 6. Adrian McEwen, Hakin 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:

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
CO 3	Describe Services Oriented Architecture and various types of cloud services.	K ₂
CO 4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.	K ₂
CO 5	Apply the 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.

BCBS070**Introduction to Business Analytics & Data Science**

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

CO 1	Define the basics of business analysis and Data Science	K ₁
CO 2	Explain data management and handling and Data Science Project Life Cycle	K ₂
CO 3	Describe the data mining concept and its Techniques	K ₂
CO 4	Apply the machine learning concept	K ₃
CO5	Describe the application of business analysis in different domain	K ₂

DETAILED SYLLABUS**3-0-0**

Unit	Topic	Proposed Lecture
I	Introduction: What is business analytics? Historical Overview of data analysis, Data Scientist vs. Data Engineer vs. Business Analyst, Career in Business Analytics, what is data science, Why Data Science, Applications for data science, Data Scientists Roles and Responsibility	08
II	Data: Data Collection, Data Management, Big Data Management, Organization/sources of data, Types of Data, Importance of data quality, Dealing with missing or incomplete data, Data Visualization, Data Classification Data Science Project Life Cycle: Business Requirement, Data Acquisition, Data Preparation, Hypothesis and Modeling, Evaluation and Interpretation, Deployment, Operations, Optimization.	08
III	Introduction to Data Mining, The origins of Data Mining, Data Mining Tasks, OLAP and Multidimensional data analysis, Basic concept of Association Analysis and Cluster Analysis.	08
IV	Introduction to Machine Learning: History and Evolution, AI Evolution, Statistics V/S Data Mining V/S Data Analytics V/S, Data Science, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Frameworks for building Machine Learning Systems.	08
V	Application of Business Analysis: Retail Analytics, Marketing Analytics, Financial Analytics, Healthcare Analytics, Supply Chain Analytics.	08

Text books:

1. B. Pochiraju and S. Seshadri, "Essentials of Business Analytics: An Introduction to the Methodology and Its Applications", 1st ed. Springer International Publishing, 2019.
2. A. C. Müller and S. Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1st ed. O'Reilly Media, 2016.
3. L. Igual and S. Seguí, "Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications", 2nd ed. Springer Cham, 2024.
4. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education India, 2021.
5. G. Koole, "An Introduction to Business Analytics: An Introduction to the Methodology and Its Application", 1st ed. Lulu Press, 2019.

BCS073**Design and Development of Applications****Course Outcome (CO)****Bloom's
Knowledge
Level (KL)****At the end of the course, the student will be able to:**

CO 1	Explain the technology and business trends impacting mobile applications	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 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)
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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 ₂
CO 2	Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.	K ₂
CO 3	Comprehend and apply authentication, email security, web security services and mechanisms.	K ₂
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 ₂

DETAILED SYLLABUS

- 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.
- 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.
- Write a Java program to perform encryption and decryption using the following algorithms: a. Ceaser Cipher b. Substitution Cipher c. Hill Cipher.
- Write a Java program to implement the DES algorithm logic.
- Write a C/JAVA program to implement the Blowfish algorithm logic.
- Write a C/JAVA program to implement the Rijndael algorithm logic.
- 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.
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.
- Calculate the message digest of a text using the MD5 algorithm in JAVA.
- Write a java program for Knapsack using Dynamic Programming based solution.

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

BCBS752**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:		
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

BCBS753/ BCBS851**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