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

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. 4TH YEAR

Computer Science and Engineering (Cyber Security)

Based On

NEP2020

(Effective from the Session: 2025-26)

B. TECH (COMPUTER SCIENCE ENGINEERING (CYBER SECURITY) 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	BCCS701	Ethical Hacking	Offline	3	-	-	20	10	30		70		100	3
2	B**07*	Deptt- 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	BCCS751	Ethical Hacking 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 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	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. BCCS070- Social Network Security
4. BCS073- Design and Development of Applications

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

BCCS701	**Ethical Hacking**	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able:		
CO 1	To understand the basics of computer based vulnerabilities.	K_1
CO 2	To explore different foot printing, reconnaissance and scanning methods.	K_2
CO 3	To understand hacking options available in Web and wireless applications.	K_1
CO 4	To explore the options for network protection.	K_2
CO 5	To practice tools to perform ethical hacking to expose the vulnerabilities.	K_2

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	INTRODUCTION Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security	**08**
II	FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall	**08**
III	ENUMERATION AND VULNERABILITY ANALYSIS Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss	**08**
IV	SYSTEM HACKING Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade	**08**
V	NETWORK PROTECTION SYSTEMS Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network- Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.	**08**

Text books:

1. Michael T. Simpson, Kent Backman, and James E. Corley, "Hands-On Ethical Hacking and Network Defense", Course Technology, Delmar Cengage Learning, 2010.
2. Robert C. Nelson, "Flight Stability and Automatic Control", McGraw-Hill, Inc, 1998.
3. P. H. Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd ed. Syngress, Elsevier, 2013.
4. D. Stuttard and M. Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd ed. John Wiley & Sons, 2011.
5. J. Seitz and T. Arnold, "Black Hat Python: Python Programming for Hackers and Pentesters", 2nd ed. No Starch Press, 2021.

BCS070	**Internet of Things**	
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to:		
CO 1	Describe the basic concepts, principles and challenges in IoT.	K2
CO 2	Explain the functioning of hardware devices and sensors used for IoT.	K2
CO 3	Understand the network communication aspects and protocols used in IoT.	K1
CO 4	Apply IoT for developing real life applications using Ardunio programming.	K3
CP 5	Develop 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 Ardunio:** Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio 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 Madisetti, "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)**
At the end of course , the student will be able to understand		
CO 1	Describe architecture and underlying principles of cloud computing.	K_2
CO 2	Explain need, types and tools of Virtualization for cloud.	K_2
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 and analyze the advanced cloud technologies.	K_4
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 – laaS – 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.

BCCS070 Social Network Security

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	To develop semantic web related simple applications	K_2
CO 2	To explain Privacy and Security issues in Social Networking	K_2
CO 3	To explain the data extraction and mining of social networks	K_2
CO 4	To discuss the prediction of human behavior in social communities	K_1
CO 5	To describe the Access Control, Privacy and Security management of social networks	K_2

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	FUNDAMENTALS OF SOCIAL NETWORKING Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security	**08**
II	SECURITY ISSUES IN SOCIAL NETWORKS The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world.	**08**
III	EXTRACTION AND MINING IN SOCIAL NETWORKING DATA Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy	**08**
IV	PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties	**08**
V	ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning	**08**

Text books:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Application", First Edition, Springer, 2010.
3. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected World", First Edition, Cambridge University Press, 2010.
4. Easley D. Kleinberg J., "Networks, Crowds, and Markets – Reasoning about a Highly Connected World", Cambridge University Press, 2010.
5. Jackson, Matthew O., "Social and Economic Networks", Princeton University Press, 2008.
6. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition, Springer, 2011.

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	Be exposed to technology and business trends impacting mobile applications	K_1
CO 2	Be competent with the characterization and architecture of mobile applications.	K_2
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_3
CO 5	Be exposed to Android and iOS platforms to develop the mobile applications	K_2

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.

BCCS751 Ethical Hacking LAB

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	To express knowledge on basics of computer based vulnerabilities	K3
CO 2	To gain understanding on different foot printing, reconnaissance and scanning methods.	K4
CO 3	To demonstrate the enumeration and vulnerability analysis methods	K4
CO 4	To gain knowledge on hacking options available in Web and wireless applications.	K2
CO 5	To use tools to perform ethical hacking to expose the vulnerabilities.	K2

DETAILED SYLLABUS

1. Install Kali or Backtrack Linux / Metasploitable/ Windows XP.
2. Practice the basics of reconnaissance.
3. Using FOCA / SearchDiggity tools, extract metadata and expanding the target list
4. Aggregates information from public databases using online free tools like Paterva's Maltego
5. Information gathering using tools like Robtex
6. Scan the target using tools like Nessus.
7. View and capture network traffic using Wireshark
8. Automate dig for vulnerabilities and match exploits using Armitage.
9. Use USBDeview to find the last connected USB to the system
10. Perform Live Forensics Case Investigation using Autopsy
11. Study Email Tracking and EmailTracing and write a report on them

FOCA : http://www.informatica64.com/foca.aspx
Nessus : http://www.tenable.com/products/nessus.
Wireshark : http://www.wireshark.org.
Armitage : http://www.fastandeasyhacking.com/.
Kali or Backtrack Linux, Metasploitable, Windows XP

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