Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
Telephone and Fax. 02140 - 275142
www.dbatu.ac.in

Structure and Detailed Syllabus

for UG Degree

Minor in Cyber Security

in line with New Education Policy 2020

(Effective from Academic year 2024-25 for main campus)

Bucket for Minor in Cyber Security

Case I: B. Tech degree with Minor in Cyber Security (160-176 credits)

The Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with multidisciplinary minor (min.160-max.176 Credits) i.e. "**B. Tech in chosen Engg./ Tech. Discipline with Minor in Cyber Security**" (160-176 credits) enables students to take up four-six or required additional courses of 14 credits in the discipline other than **chosen Engg./ Tech. Discipline** distributed over semesters III to VIII.

Case II: Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor 180-194 credits)

The **Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor** (Multidisciplinary and Specialization Minor, 180-194 credits), i.e. "**B. Tech in chosen Engg./ Tech. Discipline with minor in *other selected discipline in* Engineering (as MDM) with Specialization Minor in Cyber Security**" (180-194 credits) enables students to take up four-six additional courses of 14 credits in the discipline other than **chosen Engg./ Tech. Discipline** (for completion of multidisciplinary minor) and 18 to 20 extra credits in the **Cyber Security** distributed over semesters III to VIII. Here, the ***other selected discipline* in Engineering should be different from Specialization Minor i.e. Cyber Security**. This enables students to take up four-six or required additional courses of 18 to 20 credits in the discipline of **Cyber Security** distributed over semesters III to VIII, which are over and above the min.160-max.176 Credits. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, prescribed for the duration of four years will be taken by respective BoS. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.

Basic Semester wise credit distribution of the syllabus is as follows as per NEP-2020.

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		--	--	--	--	--	14-18
Engineering Science Course		10-08	06-04		--	--	--	--	--	16-12
Programme Core Course (PCC)	Program Courses	--	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		--	--	--	--	04	08	02	06	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		-	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship/Economics/ Management Courses		--		02	02	--	--	--	--	04
Indian Knowledge System (IKS)			02		--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--		04	04
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	-	-	02
Project		--	--	--	--	--	--		04	04
Internship/ OJT		--	---			--	--	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	-	04
Total Credits (Major)		**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**160-176**

List of Courses for

Minor in Cyber Security

Sr. No.	Course Name	Teaching Scheme	Duration (Weeks)	Credits	Institute Offering Course	Name of Professor/ Resource person	Link
1	Introduction to Cyber Security	3Hrs/Week	12	4	Uttarakhand Open University, Haldwani	Dr. Jeetendra Pande	https://onlinecourses.swayam2.ac.in/nou24_cs04/preview
2	Cyber Security Tools Techniques and Counter Measures	4 Hrs/Week	12	3	Dr. Babasaheb Ambedkar Open University, Ahmedabad, Gujrat	Prof. Dr. Nilesh K Modi	https://onlinecourses.swayam2.ac.in/nou24_ge24/preview
3	Foundations of Cryptography	4 Hrs/Week	12	3	IIIT Bangalore	Prof. Ashish Choudhury	https://onlinecourses.nptel.ac.in/noc24_cs01/preview
4	Privacy and Security in Online Social Media	4 Hrs/Week	12	3	IIIT Hyderabad	Prof. Ponnurangam Kumaraguru	https://onlinecourses.nptel.ac.in/noc24_cs04/preview
5	Information Security		16	5	Mahatma Gandhi College, Iritty, Kannur-Kerala	Dr. Reshma P K	https://onlinecourses.swayam2.ac.in/cec24_cs06/preview
6	Ethical Hacking	4 Hrs/Week	12	3	IIT Kharagpur	Prof. Indranil Sen Gupta	https://onlinecourses.nptel.ac.in/noc22_cs13/preview
7	Digital Forensic	4 Hrs/Week	16	4	Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P.)	Dr. Navjot Kaur Kanwal	https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
8	Cryptography And Network Security	4 Hrs/Week	12	3	IIT Kharagpur	Prof. Sourav Mukhopadhyay	https://onlinecourses.nptel.ac.in/noc22_cs90/preview

Introduction to Cyber Security

Week 1: Introduction to Cyber Space
History of Internet [Dr. Jeetendra Pande, Uttarakhand Open University]
Cyber Crime [Dr. Jeetendra Pande, Uttarakhand Open University]
Information Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Computer Ethics and Security Policies [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Week 2: Choosing the Best Browser according to the requirement and email security
Guidelines to choose web browsers [Mr. Arun Kumar- CISSP]
Securing web browser [Mr. Arun Kumar- CISSP]
Antivirus [Mr. Arun Kumar- CISSP]
Email security [Dr. Ajay Prasad, UPES, Dehradun]
Quiz

Week 3: Guidelines for secure password and wi-fi security
Guidelines for setting up a Secure password [Mr. Arun Kumar- CISSP]
Two-steps authentication [Mr. Arun Kumar- CISSP]
Password Manager [Mr. Arun Kumar- CISSP]
Wi-Fi Security [Dr. Jeetendra Pande]
Quiz

Week 4: Guidelines for social media and basic Windows security
Guidelines for social media security [Dr. V.V. Rao, Scientist- CERT-In]
Tips and best practices for safer Social Networking [Dr. V..V. Rao, Scientist- CERT-In]
Basic Security for Windows [Dr. Jeetendra Pande, Uttarakhand Open University]
User Account Password [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Week 5: Smartphone security guidelines
Introduction to mobile phones [Dr. Jeetendra Pande, Uttarakhand Open University]
Smartphone Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Android Security [Dr. Jeetendra Pande, Uttarakhand Open University]
IOS Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Week 6: Cyber Security Initiatives in India
Counter Cyber Security Initiatives in India [Mr. Ashutosh Bahuguna- Scientist- CERT-In]
Cyber Security Exercise [Mr. Ashutosh Bahuguna- Scientist- CERT-In]
Cyber Security Incident Handling [Mr. Ashutosh Bahuguna- Scientist- CERT-In]
Cyber Security Assurance [Mr. Ashutosh Bahuguna- Scientist- CERT-In]
Quiz

Week 7: Online Banking, Credit Card and UPI Security

Online Banking Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Mobile Banking Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Security of Debit and Credit Card [Dr. Jeetendra Pande, Uttarakhand Open University]
UPI Security [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Week 8: Micro ATM, e-wallet and POS Security

Security of Micro ATMs [Dr. Jeetendra Pande, Uttarakhand Open University]
e-wallet Security Guidelines [Dr. Jeetendra Pande, Uttarakhand Open University]
Security Guidelines for Point of Sales(POS) [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Week 9: Social Engineering

Social Engineering [Dr. Jeetendra Pande, Uttarakhand Open University]
Types of Social Engineering [Dr. Jeetendra Pande,Uttarakhand Open University]
How Cyber Criminal Works [Er. Jayash Sharma, Anand Engineering College]
How to prevent for being a victim of Cyber Crime [Er. Jayash Sharma, Anand Engineering College]
Quiz

Week 10: Cyber Security Threat Landscape and Techniques

Cyber Security Threat Landscape [Dr. A Murli Rao, IGNOU]
Emerging Cyber Security Threats [Dr. A Murli Rao, IGNOU]
Cyber Security Techniques [Ms. Tripti Misra and Ms. Shahina Anwaru, Assistant Professor- UPES, Dehradun]
Firewall [Dr. Ajay Prasad, UPES, Dehradun]
Quiz

Week 11: IT Security Act and Misc. Topics

IT Act [Dr. Darpan Anand, Associate Professor- Chandigarh University]
Hackers-Attacker-Countermeasures [Dr. A Murli Rao, Head- Computer Division, IGNOU]
Web Application Security [Dr. A Murli Rao, Head- Computer Division, IGNOU]
Digital Infrastructure Security [Dr. A Murli Rao, Head- Computer Division, IGNOU]
Defensive Programming [Dr. A Murli Rao, Head- Computer Division, IGNOU]
Quiz

Week 12: Information Destroying and Recovery Tools

Recovering from Information Loss [Dr. Jeetendra Pande, Uttarakhand Open University]
Destroying Sensitive Information [Dr. Jeetendra Pande, Uttarakhand Open University]
CCleaner for Windows [Dr. Jeetendra Pande, Uttarakhand Open University]
Quiz

Cyber Security Tools Techniques and Counter Measures

Week-1: Cyber Security Essentials, Attack Vectors, Threat, Risk and Vulnerability

Week-2: Advanced Persistent Threat and Cyber Kill Chain, Cyber Security Framework

Week-3: Firewall and Packet Filters, Introduction to Windows and Linux Firewall

Week-4: Attacks on Wireless Networks, Scanning For Web Vulnerabilities Tools and HTTP Utilities

Week-5: Application Inspection Tools, Password Cracking and Brute-Force Tools

Week-6: Web Attack, Information Security Basics to Policy

Week-7: Web Attack, Information Security Basics to Policy

Week-8: Intrusion Detection System, IT Assets and Wireless Security

Week-9: Cyber Security Assurance Framework, Desktop Security and Malware

Week-10: E-Commerce and Web-Application Security

Week-11: Social Engineering

Week-12: Internet Crime and Act, Intellectual Property in the Cyber world

Foundations of Cryptography

Week 1: Course Overview, Symmetric-key Encryption, Historical Ciphers, Perfect Security and Its Limitations

Week 2: Computational Security, Semantic Security and Pseudorandom Generators (PRGs)

Week 3: Stream Ciphers, Provably-secure Instantiation of PRG, Practical Instantiation of PRG, CPA-security and Pseudo-random Functions (PRFs)

Week 4: CPA-Secure Ciphers from PRF, Modes of Operations of Block Ciphers, Theoretical Constructions of Block Ciphers and Practical Constructions of Block Ciphers

Week 5: DES, AES and Message Authentication Codes (MAC)

Week 6: Information-theoretic Secure MAC, Cryptographic Hash Functions, Ideal-Cipher Model, Davies-Meyer construction and Merkle-Damgård Paradigm

Week 7: Birthday Attacks on Cryptographic Hash Functions, Applications of Hash Functions, Random Oracle Model and Authenticated Encryption

Week 8: Generic Constructions of Authenticated Encryption Schemes, Key-exchange Problem, One-way Trapdoor Functions and Cyclic Groups

Week 9: Discrete-Logarithm Problem, Computational Diffie-Hellman Problem, Decisional Diffie-Hellman Problem, Elliptic-Curve Based Cryptography and Public-Key Encryption

Week 10: El Gamal Encryption Scheme, RSA Assumption, RSA Public-key Cryptosystem, KEM-DEM Paradigm and CCA-security in the Public-key Domain

Week 11: CCA-secure Public-key Hybrid Ciphers Based on Diffie-Hellman Problems and RSA-assumption, Digital Signatures, RSA Signatures and Schnorr Identification Scheme

Week 12: Schnorr Signature, Overview of TLS/SSL, Number Theory, Interactive Protocols and Farewell

Privacy and Security in Online Social Media

Week 1: What is Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs

Week 2: Collecting data from Online Social Media.

Week 3: Trust, credibility, and reputations in social systems

Week 4: Trust, credibility, and reputations in social systems

Week 5: Online social Media and Policing

Week 6: Information privacy disclosure, revelation and its effects in OSM and online social networks

Week 7: Phishing in OSM & Identifying fraudulent entities in online social networks

Week 8: Refresher for all topics

Week 9 to 12: Research paper discussion

Information Security

Week 1
Day 1 Introduction to Information Security
Day 2 Protection Vs Security
Day 3 Aspects of security

Week 2
Day 1 Security problems
Day 2 User authentication
Day 3 Orange Book

Week 3
Day 1 Security threats
Day 2 Program threats
Day 3 Worms and viruses

Week 4
Day 1 More on Malware
Day 2 Trojan horse and Trap door
Day 3 Trojan Horse- A Case study
Day 4 Trap door- A Case study

Week 5
Day 1 Stack and buffer overflow
Day 2 System threats
Day 3 Communication threats
Day 4 Threats in Networks

Week 6
Day 1 New Trends in Information Security
Day 2 Introduction to Cryptography
Day 3 Cryptography Trends

Week 7
Day 1 Substitution techniques-I
Day 2 Substitution techniques-II
Day 3 Transposition ciphers

Week 8
Day 1 Overview of symmetric key algorithms
Day 2 Data Encryption standard
Day 3 Illustration of DES

Week 9
Day 1 Advanced Encryption standards
Day 2 The AES Cipher
Day 3 Illustration of AES

Week 10
Day 1 Public Key encryption
Day 2 More on Public Key Encryption
Day 3 RSA algorithm
Day 4 The security of RSA

Week 11
Day 1 Diffie-Hellman key exchange
Day 2 ECC Cryptography
Day 3 Message authentication
Day 4 Message Authentication-II

Week 12
Day 1 Cryptographic hash Functions
Day 2 Digital signature
Day 3 Symmetric key and Public key signature

Week 13
Day 1 Message Digests
Day 2 Public key infrastructure
Day 3 Public key infrastructure-II

Week 14
Day 1 Security mechanisms-An overview
Day 2 Security mechanisms-Examples
Day 3 Auditing and logging

Week 15
Day 1 Trip wire
Day 2 System call monitoring
Day 3 System call monitoring- Case study

Week 16
Day 1 Fire wall & Physical security
Day 2 Legal and Ethical Issues in Security Systems
Day 3 Security Challenges for Cloud computing

Ethical Hacking

Week 1: Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

Week 2: IP addressing and routing. TCP and UDP. IP subnets.

Week 3: Routing protocols. IP version 6.

Week-4: Installation of attacker and victim system. Information gathering using advanced google search, archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool**.**

Week-5: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment, System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

Week 6: Introduction to cryptography, private-key encryption, public-key encryption.

Week 7: Cryptographic hash functions, digital signature and certificate, applications.

Week 8: Steganography, biometric authentication, network-based attacks, DNS and Email security.

Week-9: Packet sniffing using wireshark and burpsuite, password attack using burp suite. Social engineering attacks and Denial of service attacks.

Week 10: Elements of hardware security: side-channel attacks, physical inclinable functions, hardware trojans.

Week-11: Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc.Attack on web servers: password attack, SQL injection, cross site scripting.

Week 12: Case studies: various attacks scenarios and their remedies.

Digital Forensic

Week 1:
Lecture 1-Introduction to Digital Forensics
Lecture 2-Fundamentals of Computer Hardware and accessories-1
Lecture 3- Fundamentals of Computer Hardware and accessories-2

Week 2:
Lecture 4- Computer architecture
Lecture 5- Understanding the binary number system & Conversions
Lecture 6-Encoding and Decoding formats

Week 3:

Lecture 7-Methods of storing data
Lecture 8-Computer Memory
Lecture 9-Development of hard disk, physical construction, CHS & LBA addressing

Week-4:
Lecture 10-Processor
Lecture 11-Software
Lecture 12-Operating System Part I

Week-5:
Lecture 13-Operating System Part II (History & Development)
Lecture 14-Understanding file system –I
Lecture 15-Understanding file system-II (file formats)

Week 6:
Lecture 16-Networking and types of networks
Lecture 17-Networking Devices
Lecture 18-Internet

Week 7:
Lecture 19-The Internet Protocols
Lecture 20-Definition and types of computer crimes
Lecture 21-Distinction between computer crimes and conventional crimes.

Week 8:
Lecture 22-Basic Concepts of Network security –I
Lecture 23-Basic Concepts of Network security –II
Lecture 24-Encryption and decryption methods

.

Week-9:
Lecture 25-Types of computer crimes-l Computer virus, and computer worm, Trojan horse, trap door, super zapping, logic bombs.
Lecture 26-Types of computer crimes-ll Social media crimes, intellectual property crimes, cyber pornography & child pornography, cyber terrorism, hate speech and cyber security
Lecture 27-Types of computer crimes –lll

Week 10:
Lecture 28-Seizure of suspected computer. Preparation required prior to seizure
Lecture 29-Legal and privacy issues in computer forensics
Lecture 30-Open and Proprietary tools for Digital Forensics

Week-11:
Lecture 31-Disk Forensics
Lecture 32-Digital Forensics-Memory & Network forensics
Lecture 33-Computer forensic investigation Restoration of deleted files, Password cracking, Email

Week 12:
Lecture 34-Digital Forensics - Mobile phone Forensics
Lecture 35-Digital Forensics – forensics
Lecture 36-Relevant law to combat computer crime –Information Technology Act

Week 13:
Lecture 37-Discussion on Practical aspects of IT Act
Lecture 38-New challenges of computer forensic-I
Lecture 39-New challenges of computer forensic- II

Cryptography and Network Security

Week 1: Introduction to cryptography, Classical Cryptosystem, Block Cipher.

Week 2: Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher.

Week 3: LFSR based Stream Cipher, Mathematical background, Abstract algebra, Number Theory.

Week 4: Modular Inverse, Extended Euclid Algorithm, Fermat's Little Theorem, Euler Phi-Function, Euler's theorem.

Week 5: Advanced Encryption Standard (AES), Introduction to Public Key Cryptosystem, Diffie-Hellman Key Exchange, Knapsack Cryptosystem, RSA Cryptosystem.

Week 6: Primarily Testing, ElGamal Cryptosystem, Elliptic Curve over the Reals, Elliptic curve Modulo a Prime.

Week 7: Generalized ElGamal Public Key Cryptosystem, Rabin Cryptosystem.

Week 8: Message Authentication, Digital Signature, Key Management, Key Exchange, Hash Function.

Week 9: Cryptographic Hash Function, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS).

Week 10: Cryptanalysis, Time-Memory Trade-off Attack, Differential and Linear Cryptanalysis.

Week 11: Cryptanalysis on Stream Cipher, Modern Stream Ciphers, Shamir's secret sharing and BE, Identity-based Encryption (IBE), Attribute-based Encryption (ABE).

Week 12: Side-channel attack, The Secure Sockets Layer (SSL), Pretty Good Privacy (PGP), Introduction to Quantum Cryptography, Blockchain, Bitcoin and Cryptocurrency.