

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in COMPUTER SCIENCE AND ENGINEERING (CYBER
SECURITY) COURSE STRUCTURE & SYLLABUS (R18)

Applicable From 2020-21 Admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics - I	3	1	0	4
2	CH102BS	Chemistry	3	1	0	4
3	EE103ES	Basic Electrical Engineering	3	0	0	3
4	ME105ES	Engineering Workshop	1	0	3	2.5
5	EN105HS	English	2	0	0	2
6	CH106BS	Engineering Chemistry Lab	0	0	3	1.5
7	EN107HS	English Language and Communication Skills Lab	0	0	2	1
8	EE108ES	Basic Electrical Engineering Lab	0	0	2	1
		Induction Programme				
		Total Credits	12	2	10	19

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Mathematics - II	3	1	0	4
2	AP202BS	Applied Physics	3	1	0	4
3	CS203ES	Programming for Problem Solving	3	1	0	4
4	ME204ES	Engineering Graphics	1	0	4	3
5	AP205BS	Applied Physics Lab	0	0	3	1.5
6	CS206ES	Programming for Problem Solving Lab	0	0	3	1.5
7	*MC209ES	Environmental Science	3	0	0	0
		Total Credits	13	3	10	18

*MC – Mandatory Course

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS301ES	Analog and Digital Electronics	3	0	0	3
2	CS302PC	Data Structures	3	1	0	4
3	MA313BS	Mathematical and Statistical Foundations	3	1	0	4
4	CS304PC	Computer Organization and Architecture	3	0	0	3
5	CS311PC	Python Programming	2	0	0	2
6	CS306ES	Analog and Digital Electronics Lab	0	0	2	1
7	CS307PC	Data Structures Lab	0	0	3	1.5
8	CS308PC	IT Workshop Lab	0	0	3	1.5
9	CS312PC	Python Programming Lab	0	0	2	1
10	*MC309	Gender Sensitization Lab	0	0	2	0
		Total Credits	14	2	12	21

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS401PC	Discrete Mathematics	3	0	0	3
2	SM402MS	Business Economics & Financial Analysis	3	0	0	3
3	CS403PC	Operating Systems	3	0	0	3
4	CS414PC	Computer Networks	3	1	0	4
5	CS412PC	Object Oriented Programming using Java	3	1	0	4
6	CS406PC	Operating Systems Lab	0	0	3	1.5
7	CS415PC	Computer Networks Lab	0	0	3	1.5
8	CS408PC	Java Programming Lab	0	0	2	1
9	*MC409	Constitution of India	3	0	0	0
		Total Credits	18	2	8	21

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Design and Analysis of Algorithms	3	0	0	3
2		Cryptography and Network Security	3	0	0	3
3		Database Management Systems	3	0	0	3
4		Formal Languages and Automata Theory	3	0	0	3
5		Professional Elective - I	3	0	0	3
6		Professional Elective - II	3	0	0	3
7		Cryptography and Network Security Lab	0	0	3	1.5
8		Database Management Systems Lab	0	0	3	1.5
9		Advanced Communication Skills Lab	0	0	2	1
10		Intellectual Property Rights	3	0	0	0
		Total Credits	21	0	8	22

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Cyber Security	3	1	0	4
2		Cyber Crime Investigation & Digital Forensics	3	1	0	4
3		Software Engineering	3	1	0	4
4		Professional Elective – III	3	0	0	3
5		Open Elective - I	3	0	0	3
6		Cyber Security Lab	0	0	3	1.5
7		Cyber Crime Investigation & Digital Forensics Lab	0	0	3	1.5
8		Professional Elective – III Lab	0	0	2	1
9		Environmental Science	3	0	0	0
		Total Credits	18	3	8	22

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Vulnerability Assessment & Penetration Testing	3	0	0	3
2		Network Management Systems and Operations	2	0	0	2
3		Professional Elective - IV	3	0	0	3
4		Professional Elective - V	3	0	0	3
5		Open Elective - II	3	0	0	3
6		Vulnerability Assessment & Penetration Testing lab	0	0	2	1
7		Industrial Oriented Mini Project / Summer Internship	0	0	0	2*
8		Seminar	0	0	2	1
9		Project Stage - I	0	0	6	3
		Total Credits	14	0	10	21

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Organizational Behaviour	3	0	0	3
2		Professional Elective - VI	3	0	0	3
3		Open Elective - III	3	0	0	3
4		Project Stage - II	0	0	14	7
		Total Credits	9	0	14	16

***Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

MC - Environmental Science – Should be Registered by Lateral Entry Students Only.

MC – Satisfactory/Unsatisfactory.

Professional Elective - I

	Compiler Design
	Artificial Intelligence
	Data warehousing and Data Mining
	Ad-hoc & Sensor Networks
	Cloud Computing

Professional Elective - II

	Ethical Hacking
	Data Science
	Distributed Systems
	Cyber Laws
	IoT Security

Professional Elective - III

	Mobile Application Security
	Machine Learning
	DevOps
	Mobile Application Development
	Blockchain Technology

Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Professional Elective - IV

	Edge Analytics
	Web & Database Security
	Computer Security & Audit Assurance
	Social Media Security
	Deep Learning

Professional Elective - V

	Quantum Computing
	Data Analytics for Fraud Detection
	5G Technologies
	Security Incident & Response Management (SOC)
	Authentication Techniques

Professional Elective – VI

	Quantum Cryptography
	IoT Cloud Processing and Analytics
	Cloud Security
	Digital Watermarking and Steganography
	Data Privacy

NAME OF THE PROGRAM: R18 B.Tech. COMPUTER SCIENCE AND ENGINEERING(CYBER SECURITY)

S.No.	Semester	Course Code	Course Name	CO No	Course outcome (Cos)
1	1 SEM	MA101BS	Mathematics - I	CO1	Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
				CO2	Find the Eigen values and Eigen vectors
				CO3	Reduce the quadratic form to canonical form using orthogonal transformations.
				CO4	Analyse the nature of sequence and series
				CO5	Solve the applications on the mean value theorems.
				CO6	Evaluate the improper integrals using Beta and Gamma functions
2	1 SEM	CH102BS /CH202BS:	CHEMISTRY	CO1	The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
				CO2	The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments
				CO3	The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
				CO4	The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.
3	1 SEM	EE103ES/EE203ES	BASIC ELECTRICAL ENGINEERING	CO1	Get an exposure to basic electrical laws
				CO2	Understand the response of different types of electrical circuits to different excitations
				CO3	Understand the measurement, calculation and relation between the basic electrical parameters
				CO4	Understand the basic characteristics of transformers and electrical machines.
4	1 SEM	ME105ES /ME205ES	Engineering Workshop	CO1	Study and practice on machine tools and their operations
				CO2	Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
				CO3	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
				CO4	Apply basic electrical engineering knowledge for house wiring practice.
5	1 SEM	EN105HS /EN205HS	ENGLISH	CO1	Use English Language effectively in spoken and written forms.
				CO2	Comprehend the given texts and respond

					appropriately
				C03	Communicate confidently in various contexts and different cultures
				C04	Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
6	2 SEM	MA201BS	MATHEMATICS - II	C01	Identify whether the given differential equation of first order is exact or not
				C02	Solve higher differential equation and apply the concept of differential equation to real world problems
				C03	Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped
				C04	Evaluate the line, surface and volume integrals and converting them from one to another
7		AP102BS/ AP202BS	APPLIED PHYSICS	C01	The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. .
				C02	The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on
				C03	Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
				C04	The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials
8		CS103ES/ CS203ES	PROGRAMMING FOR PROBLEM SOLVING	C01	To write algorithms and to draw flowcharts for solving problems.
				C02	To convert the algorithms/flowcharts to C programs
				C03	To code and test a given logic in C programming language.
				C04	To decompose a problem into functions and to develop modular reusable code
				C05	To use arrays, pointers, strings and structures to write C programs
				C06	Searching and sorting problems.
9		ME104ES /ME204ES	ENGINEERING GRAPHICS	C01	Preparing working drawings to communicate the ideas and information.
				C02	Read, understand and interpret engineering drawings.

10	3 SEM	CS301ES	Analog and Digital Electronics	CO1	Know the characteristics of various components. Understand the utilization of components
				CO2	Design and analyze small signal amplifier circuits
				CO3	Learn Postulates of Boolean algebra and to minimize combinational functions
				CO4	Design and analyze combinational and sequential circuits
				CO5	Know about the logic families and realization of logic gates
11		CS302PC	DATA STRUCTURES	CO1	Ability to select the data structures that efficiently model the information in a problem. .
				CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations
				CO3	Design programs using a variety of data structures, including hash tables, binary and general
				CO4	Implement and know the application of algorithms for sorting and pattern matching
				CO5	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
12		MA313BS	MATHEMATICAL AND STATISTICAL FOUNDATIONS	CO1	Apply the number theory concepts to cryptography domain
				CO2	Apply the concepts of probability and distributions to some case studies
				CO3	Correlate the material of one unit to the material in other units
				CO4	Resolve the potential misconceptions and hazards in each topic of study
13		CS304PC	COMPUTER ORGANIZATION AND ARCHITECTURE	CO1	Understand the basics of instructions sets and their impact on processor design
				CO2	Demonstrate an understanding of the design of the functional units of a digital computer system.
				CO3	Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory
				CO4	Design a pipeline for consistent execution of instructions with minimum hazards
				CO5	Recognize and manipulate representations of numbers stored in digital computers

14		CS311PC	PYTHON PROGRAMMING	CO1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
				CO2	Demonstrate proficiency in handling Strings and File Systems
				CO3	Create, run and manipulate Python Programs using core data structures like Lists Dictionaries and use Regular Expressions.
				CO4	Interpret the concepts of Object-Oriented Programming as used in Python
				CO5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python
15	4 SEM	CS401PC	DISCRETE MATHEMATICS	CO1	Ability to understand and construct precise mathematical proofs
				CO2	Ability to use logic and set theory to formulate precise statements
				CO3	Ability to analyze and solve counting problems on finite and discrete structures
				CO4	Ability to describe and manipulate sequences
				CO5	Ability to apply graph theory in solving computing problems
16		SM402MS	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	CO1	The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company
17			OPERATING SYSTEMS	CO1	Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
				CO1	Introduce the issues to be considered in the design and development of operating system
				CO3	Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix
18			COMPUTER NETWORKS	CO1	The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks. .
				CO2	Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers
19		CS412PC	Object	CO1	Able to solve real world problems using OOP

			Oriented Programming through Java		techniques.	
				CO2	Able to understand the use of abstract classes	
				CO3	Able to solve problems using java collection framework and I/o classes	
				CO4	Able to develop multithreaded applications with synchronization.	
				CO5	Able to develop applets for web applications	
				CO6	Able to design GUI based applications	
20	5 SEM		DESIGN AND ANALYSIS OF ALGORITHMS	CO1	Ability to analyze the performance of algorithms	
				CO2	Ability to choose appropriate data structures and algorithm design methods for a specified application	
					CO3	Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
21			CRYPTOGRAPHY AND NETWORK SECURITY	CO1	Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.	
				CO2	Ability to identify information system requirements for both of them such as client and server	
				CO3	Ability to understand the current legal issues towards information security.	
22			DATABASE MANAGEMENT SYSTEMS	CO1	Gain knowledge of fundamentals of DBMS, database design and normal forms	
				CO2	Master the basics of SQL for retrieval and management of data	
				CO3	.Be acquainted with the basics of transaction processing and concurrency control	
				CO4	Familiarity with database storage structures and access techniques	
23			FORMAL LANGUAGES AND AUTOMATA THEORY	CO1	Able to understand the concept of abstract machines and their power to recognize the languages	
				CO2	Able to employ finite state machines for modeling and solving computing problems	
			CO3	Able to design context free grammars for formal languages		
			CO4	Able to distinguish between decidability and undecidability		
			CO5	Able to gain proficiency with mathematical tools and formal methods		
24		ETHICAL HACKING	CO1	Gain the knowledge of the use and availability of tools to support an ethical hack		

			(Professional Elective – II	CO2	Gain the knowledge of interpreting the results of a controlled attack
				CO3	Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
				CO4	Comprehend the dangers associated with penetration testing
25	6 SEM		CYBER SECURITY	CO1	Analyze and evaluate the cyber security needs of an organization.
				CO2	Understand Cyber Security Regulations and Roles of International Law
				CO3	Design and develop a security architecture for an organization
				CO4	Understand fundamental concepts of data privacy attacks
26			CYBER CRIME INVESTIGATIONS AND DIGITAL FORENSICS	CO1	Understand the fundamentals of cybercrime and issues.
				CO2	Understand different investigation tools for cybercrime.
				CO3	Understand basics of Forensic Technology and Practices.
				CO4	Analyze different laws, ethics and evidence handling procedures
27			SOFTWARE ENGINEERING	CO1	Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
				CO2	Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
				CO3	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
28			BLOCKCHAIN TECHNOLOGY (Professional Elective – III)	CO1	Learn about research advances related to one of the most popular technological areas today.
				CO2	Understand Extensibility of Blockchain concepts
				CO3	Understand and Analyze Blockchain Science.
				CO4	Understand Technical challenges, Business model challenges
29			Fundamentals of Internet of Things	CO1	Known basic protocols in sensor networks.
		CO2		Program and configure Arduino boards for various designs.	
		CO3		Python programming and interfacing for Raspberry Pi.	
		CO4		Design IoT applications in different domains	

30	7 SEM		VULNERABILITY ASSESSMENT AND PENETRATION TESTING	CO1	Understand social engineering attacks
				CO2	Learn to handle the vulnerabilities of a Web application
				CO3	Perform penetration testing
				CO4	Analyze the malware type and impact.
31			NETWORK MANAGEMENT SYSTEMS AND OPERATIONS	CO1	Understand the basic network elements and their services.
				CO2	To able to familiarize with different network faults and their correction techniques.
				CO3	Understand various measures of network performance
32			WEB & DATABASE SECURITY (Professional Elective – IV)	CO1	Understand the Web architecture and applications.
				CO2	Understand client side and server-side programming.
				CO3	Understand how common mistakes can be bypassed and exploit the application
				CO4	Identify common application vulnerabilities.
33			5G TECHNOLOGIES (Professional Elective – V)	CO1	Understand 5G and 5G Broadband Wireless Communications.
				CO2	Understand 5G wireless Propagation Channels
				CO3	Understand the significance of transmission and Design Techniques for 5G
				CO4	Analyze Device-to-device (D2D) and machine-to-machine (M2M) type communications.
				CO5	Learn Massive MIMO propagation channel models
34	8 SEM		ORGANIZATIONAL BEHAVIOR	CO1	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization
				CO2	Analyze the complexities associated with management of the group behavior in the organization.
				CO3	Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.
35			QUANTUM CRYPTOGRAPHY	CO1	Basic understanding about Quantum Information and Computation.
				CO2	Understand attack Strategies on QKD Protocols

			(Professional Elective – VI)	CO3	Analyze and understand statistical analysis of QKD Networks in Real-Life Environment
				CO4	Apply Quantum-cryptographic networks.