COIMBATORE, BANGALORE , CHENNAI

B. Tech - Computer Science and Engineering (Cyber Security)

(BTC-CYS)

CURRICULUM AND SYLLABI

(2020)

GENERAL INFORMATION

ABBREVIATIONS USED IN THE CURRICULUM

Cat	-	Category
L	-	Lecture
T	-	Tutorial
P	-	Practical
Cr	-	Credits
ENGG	-	Engineering Sciences (including General, Core and Electives)
HUM	-	Humanities (including Languages and others)
SCI	-	Basic Sciences (including Mathematics)
PRJ	-	Project Work (including Seminars)
AES	-	Aerospace Engineering
AIE	-	Computer Science and Engineering - Artificial Intelligence
BIO	-	Biology
CCE	-	Computer and Communication Engineering
CHE	-	Chemical Engineering
CHY	-	Chemistry
CSE	-	Computer Science and Engineering
CVL	-	Civil Engineering
CUL	-	Cultural Education
EAC	-	Electronics and Computer Engineering
ECE	-	Electronics and Communication Engineering
EEE	-	Electrical and Electronics Engineering
ELC	-	Electrical and Computer Engineering
HUM	-	Humanities
MAT	-	Mathematics
MEE	-	Mechanical Engineering
PHY	-	Physics

Course Outcome (CO) – Statements that describe what students are expected to know and are able to do at the end of each course. These relate to the skills, knowledge and behaviour that students acquire in their progress through the course.

Program Outcomes (POs) – Program Outcomes are statements that describe what students are expected to know and be able to do upon graduating from the Program. These relate to the skills, knowledge, attitude and behaviour that students acquire through the program. NBA has defined the Program Outcomes for each discipline.

Program Objectives

The B. Tech program in CSE (Cyber Security) is intended to mould students into well prepared Cyber Security professionals and has been designed with a good balance between theoretical & practical aspects, analytical and architectural methods complemented by academic research and industry best practices.

Through this program students acquire necessary theoretical background, insights into general and technical aspects of Cyber Security, a good understanding of analytical methods and management practices in the field.

Program Educational Objectives (PEOs)

The PEOs outlined below describe the expectations of what graduates will accomplish in their careers, and how they perform during the first few years after graduation.

Areas or fields where graduates can find employment: Hundreds of Cyber Security career roles in pretty much every vertical market in the industry.

Preparedness of graduates to take up higher studies: There are various tracks with ample funding to take up master's and subsequently PhD programs around the world.

- Find employment in Computer Science & Engineering and/or Cyber Security field in a professional organization.
- Apply conceptual and practical knowledge of Cyber Security along with tools and technologies to avoid, identify, counter, and recover from cyber threats.
- Communicate Cyber Security risks, threats, and countermeasures to convince decision makers to apply this understanding to develop cyber defense strategies.
- Contribute to product development as individual contributors in corporations and/or entrepreneurs in inter disciplinary fields of computer engineering & technology and Cyber Security.
- Identify, analyze, and utilize professional and academic literature in the field of Cyber Security to help solve problems and stay up to date with the rapidly changing context of global security concerns.

Program Outcomes (PO):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design and development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs

with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO):

1. Gain a thorough understanding of the Cyber Security landscape with its growing threats and vulnerabilities in the world of computing including software and hardware. Attain skills to comprehend and anticipate future challenges and devise methods to meet them and also, be articulate and skilled to convince all the stakeholders.

2. Acquire and demonstrate the ability to use standard tools, practices and technologies for the analysis, design, development and implementation of innovative and optimal Cyber Security solutions without compromising the privacy needs of individual and entities and the security concerns of law enforcement agencies

Curriculum

SEMESTER I

Cat	Code	Title	Credit
HUM	19ENG111	Technical Communication	3
ENGG	20CYS101	Classical Cryptography	2
MAT	20MAT102	Linear Algebra	4
SCI	19PHY101	Engineering Physics	3
ENGG	19CSE100	Problem Solving and Algorithmic Thinking	4
ENGG	20CYS102	Principles of Engineering	3
ENGG	20CYS103	Computer Hardware and System Essentials	3
HUM	19CUL101	Cultural Education – 1	2
			24

SEMESTER II

Cat	Code	Title	Credit
MAT	20MAT113	Discrete Mathematics	4
MAT	20MAT112	Number Theory and Algebra	3
ENGG	20CYS111	Digital Signal Processing	3
ENGG	20CYS112	Computer Organisation and Architecture	4
ENGG	20CYS113	Computer Programming	3
ENGG	20CYS181	Computer Programming lab	1
ENGG	20CYS114	Cyber Security Essentials	3
HUM	19CUL111	Cultural Education – II	2
			23

SEMESTER III

Cat	Code	Title	Credit
MAT	20CYS201	Optimization Techniques	4
ENGG	20CYS202	User Interface Design	2
ENGG	20CYS203	Operating Systems	3
ENGG	20CYS281	Operating System Lab	1
ENGG	19CSE201	Advanced Programming	3
ENGG	20CYS204	Database Management System	3
ENGG	20CYS205	Modern Cryptography	4
HUM	19AVP201	Amrita Value Program I	1
			21

SEMESTER IV

Cat	Code	Title	Credit
MAT	20CYS211	Probability and Statistics	4
CYS	20CYS212	Multimedia Processing	3
CYS	20CYS213	System Security	3
CYS	20CYS282	System Security Lab	1
CYS	20CYS215	Machine Learning in Cyber Security	3
CYS	20CYS214	Data Structures and Algorithms	3
CYS	20CYS283	Data Structures and Algorithms Lab	1
CYS	20CYS383	Java Programming Lab	1
HUM	19AVP211	Amrita Value Program II	1
HUM	19SSK211	Soft Skills – 1	2
HUM	19MNG300	Disaster Management	P/F
			22

SEMESTER V

Cat	Code	Title	Credit
CYS	20CYS301	Digital Communication	3
CYS	20CYS302	Secure Coding	4
CYS	20CYS305	Algorithms: Design and Analysis	3
CYS	20CYS303	Computer Networks	3
CYS	20CYS382	Computer Networks Lab	1
CYS	20CYS304	Artificial Intelligence and Neural Networks	4
HUM		Free Elective I	2
HUM	19SSK301	Soft Skills – 2	2
HUM	19ENV300	Environmental Science	P/F
ENGG	19LIV390	Live – in – Labs***	[3]
			22+[3]

SEMESTER VI

Cat	Code	Title	Credit
ENGG	20CYS311	Cyber Forensics	3
ENGG	20CYS312	Principles of Programming Languages	3
ENGG	20CYS384	Advanced Protocol Engineering and Security Lab	1
ENGG	20CYS313	Network Security	3
ENGG	20CYS314	Applied Cryptography	4
ENGG	20CYS315	Automata Theory and Compiler Design	3
ENGG		Professional Elective – 1	3
HUM	19SSK311	Soft Skills – 3	2
ENGG	19LIV490	Live-in-Labs	[3]
			22+[3]

SEMESTER VII

Cat	Code	Title	Credit
ENGG	20CYS401	Secure Software Engineering	3
ENGG	20CYS402	Distributed Systems and Cloud Computing	3
ENGG	20CYS403	Web Application Security	3
ENGG	20CYS404	Android Application Development	1
ENGG		Professional Elective – 2	3
ENGG		Professional Elective – 3	3
ENGG		Free Elective – 2 (Management Elective)	3
PRJ	2OCYS495	Project - Phase – 1 / Seminar	2
HUM	19LAW300	Indian Constitution	P/F
			21

SEMESTER VIII

Cat	Code	Title	Credit
PRJ	20CYS499	Project - Phase – 2	10
		Total (30hrs)	10
		Total Credits	165

*Professional Elective - Electives categorised under Engineering, Science, Mathematics, Live-in-Labs, and NPTEL Courses. Student can opt for such electives across departments/campuses. Students with CGPA of 7.0 and above can opt for a maximum of 2 NPTEL courses with the credits not exceeding 8.

** Free Electives - This will include courses offered by Faculty of Humanities and Social Sciences/ Faculty Arts, Commerce and Media / Faculty of Management/Amrita Darshanam -(International Centre for Spiritual Studies).

*** Live-in-Labs - Students undertaking and registering for a Live-in-Labs project, can be exempted from registering for an Elective course in the higher semester.

PROFESSIONAL ELECTIVES

Cat	Code	Title	Credit
Professional Elective-1			
CYS	20CYS331	Wireless Sensor Network Security	3
CSE	19CSE436	Mobile and Wireless Security	3
CSE	19CSE446	Internet of Things	3
Professional Elective-2			
CYS	20CYS431	Program Obfuscation	3
CYS	20CYS432	Vulnerability Assessment and Penetration Testing	3
CYS	20CYS433	Blockchain Technology	3
Professional Elective-3			
CYS	20CYS441	Formal Methods for Security	3
CYS	20CYS442	Hardware Security	3
CYS	20CYS443	Biometrics and Security	3

Electives in Business Systems			
Cat	Code	Title	Credit
CSE	19CSE358	Software Project Management	3
HUM	19CSE359	Financial Engineering	3
HUM	19MNG331	Financial Management	3
CYS	20MNG331	Information Security Risk Management	3

FREE ELECTIVES

	FREE ELECTIVES OFFERED UNDER MANAGEMENT STREAM		
Cat.	Code	Title	Credit
HUM	19MNG331	Financial Management	3
HUM	19MNG332	Supply Chain Management	3
HUM	19MNG333	Marketing Management	3
HUM	19MNG334	Project Management	3
HUM	19MNG335	Enterprise Management	3
HUM	19MNG338	Operations Research	3
HUM	19MEE401	Industrial Engineering	3
HUM	19MEE346	Managerial Statistics	3
HUM	19MEE347	Total Quality Management	3
HUM	19MEE342	Lean Manufacturing	3
HUM	19CSE358	Software Project Management	3
HUM	19CSE359	Financial Engineering	3
HUM	19CSE360	Engineering Economic Analysis	3
HUM	19MNG331	Financial Management	3
HUM	19CSE362	Information Systems	3

FREE ELECTIVES OFFERED UNDER HUMANITIES / SOCIAL SCIENCE STREAMS

Cat.	Code	Title	Credit
HUM	19CUL230	Achieving Excellence in Life - An Indian Perspective	2
HUM	19CUL231	Excellence in Daily Life	2
HUM	19CUL232	Exploring Science and Technology in Ancient India	2
HUM	19CUL233	Yoga Psychology	2
HUM	19ENG230	Business Communication	2
HUM	19ENG231	Indian Thought through English	2
HUM	19ENG232	Insights into Life through English Literature	2
HUM	19ENG233	Technical Communication	2
HUM	19ENG234	Indian Short Stories in English	2
HUM	19FRE230	Proficiency in French Language (Lower)	2
HUM	19FRE231	Proficiency in French Language (Higher)	2
HUM	19GER230	German for Beginners I	2
HUM	19GER231	German for Beginners II	2
HUM	19GER232	Proficiency in German Language (Lower)	2
HUM	19GER233	Proficiency in German Language (Higher)	2
HUM	19HIN101	Hindi I	2
HUM	19HIN111	Hindi II	2
HUM	19HUM230	Emotional Intelligence	2
HUM	19HUM231	Glimpses into the Indian Mind - the Growth of Modern India	2
HUM	19HUM232	Glimpses of Eternal India	2
HUM	19HUM233	Glimpses of Indian Economy and Polity	2
HUM	19HUM234	Health and Lifestyle	2
HUM	19HUM235	Indian Classics for the Twenty-first Century	2
HUM	19HUM236	Introduction to India Studies	2

HUM	19HUM237	Introduction to Sanskrit Language and Literature	2
HUM	19HUM238	National Service Scheme	2
HUM	19HUM239	Psychology for Effective Living	2
HUM	19HUM240	Psychology for Engineers	2
HUM	19HUM241	Science and Society - An Indian Perspective	2
HUM	19HUM242	The Message of Bhagwad Gita	2
HUM	19HUM243	The Message of the Upanishads	2
HUM	19HUM244	Understanding Science of Food and Nutrition	2
HUM	19JAP230	Proficiency in Japanese Language (Lower)	2
HUM	19JAP2313	Proficiency in Japanese Language (Higher)	2
HUM	19KAN101	Kannada I	2
HUM	19KAN111	Kannada II	2
HUM	19MAL101	Malayalam I	2
HUM	19MAL111	Malayalam II	2
HUM	19SAN101	Sanskrit I	2
HUM	19SAN111	Sanskrit II	2
HUM	19SWK230	Corporate Social Responsibility	2
HUM	19SWK231	Workplace Mental Health	2
HUM	19TAM101	Tamil I	2
HUM	19TAM111	Tamil II	2