



Specialization/Minor in Cyber Security

EFFECTIVE FOR 2021-22 BATCH

2ND YEAR TO 4TH YEAR

Eligible Branches to adopt as Specialization

- 1. B.Tech.- Computer Science & Engineering**
- 2. B.Tech.- Electronics and Communication Engineering**
- 3. B.Tech.- Electronics Engineering**



**VEER MADHO SINGH BHANDARI
UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN**

Evaluation Schemes for Specializations/Minor in B.Tech

Specialization in Cyber Security										
S.N	Code	Sem	Subject	Periods			Evaluation Scheme		Total Marks	Credits
				L	T	P	Internal	External		
1.	SCS301	3 rd	Cyber Security and Investigati on Techniques	3	0	0	50	100	150	3
2.	SCS401	4 th	Cryptography and Security Laws	3	0	0	50	100	150	3
3.	SCS501	5 th	Risk Management	3	0	0	50	100	150	3
4.	SCS601	6 th	Cyber Law	3	0	0	50	100	150	3
5.	SCS701	7 th	Risk Analysis And Mitigation	3	0	0	50	100	150	3
6.	SCS801	8 th	Information management	3	0	0	50	100	150	3
				18	0	0	300	600	900	18



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SCS301	CYBER SECURITY AND INVESTIGATION TECHNIQUES	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.	8
Unit 2	Cyber Security Vulnerabilities and Cyber Security Safeguards: Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	8
Unit 3	Securing Web Application, Services and Servers: Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	8
Unit 4	Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems,	8
Unit 5	Prevention Systems: Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation. Security Information Management, Network Session Analysis, System Integrity Validation.	

Suggested Readings:

1. **Cyber Security: Power and Technology**, by Martti Lehto, Pekka Neittaanmäki
2. **Fundamental of Cyber Security: Principles, Theory and Practices**, by Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed



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SCS401	CRYPTOGRAPHY AND SECURITY LAWS	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management	8
Unit 2	Security Protocols: VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.	10
Unit 3	Cyberspace and the Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.	8
Unit 4	Cyber Forensics: Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis,	10
Unit 5	Investigating Information-hiding: Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.	9

Suggested Readings:

- 1. Fundamental of Cyber Security: Principles, Theory and Practices, by Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed**
- 2. Cyber Security: Threats and Responses for Government and Business, by Jack Caravelli, Nigel Jones**



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SCS501	RISK MANAGEMENT	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	Introduction risk management, elements of Credit Risk, outline and literature, De_nition, market vs. credit Risk, The elements of credit risk: Default, exposure, and loss given default (or recovery), Expected, unexpected loss, and VaR, Credit exposure.	8
Unit 2	Pre-settlement and settlement risk, Measures of exposure, exposure pro_les, Wrong-way and right-way risk, Models of Single Counterparty Default Risk.	12
Unit 3	Scoring, logit and probit, Ratings, Rating-based models: Credit Metrics, Credit Portfolio View, Default rates implied from bond prices.	8
Unit 4	Modeling Default and Recovery: Portfolio Models, Actuarial Approach: Mortality tables, Credit Risk+, Asset return models, correlated Defaults and Credit Metrics for portfolios. Introduction to Copula distributions, Vasicek model of correlated defaults.	8

Suggested Readings:

1. Data Science For Cyber-security, by Adams Niall M, Heard Nicholas A, Rubin-delanchy Patrick, Turcotte Mellisa
2. Research Methods for Cyber Security, by Thomas W. Edgar, David O. Manz
3. Cybersecurity: The Beginner's Guide: A comprehensive guide to getting ...
By Erdal Ozkaya



VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN

SCS601	CYBER LAW	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	Introduction to cyber law : Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Cyber Laws of other countries: EU GDPR, PIPEDA (Canada), etc.	10
Unit 2	Information technology Act : Overview of IT Act, 2000, Amendments in 2008/2013 and Limitations of ITAct, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Li- ability,	12
Unit 3	Cyber law and related Legislation : Patent Law, Trademark Law, Copyright, Software Copyright or Patented, Do- main Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).	10
Unit 4	Electronic Business and legal issues : Legal issues in Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security.	8
Unit 5	Application area : Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	

Suggested Readings :

1. Handbook of Cyber Laws, by Vakul Sharma, Macmillan, 2002.
2. Cyber Security: Power and Technology, by Martti Lehto, Pekka Neittaanmäki
3. Fundamental of Cyber Security: Principles, Theory and Practices, by Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed
4. Cyber Security: Threats and Responses for Government and Business, by Jack Caravelli, Nigel Jones



VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN

SCS701	RISK ANALYSIS AND MITIGATION	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	An Introduction to Risk Management: Introduction to the Theories of Risk Management; The Changing Environment; The Art of Managing Risks	8
Unit 2	The Threat Assessment Process: Threat Assessment and its Input to Risk Assessment; Threat Assessment Method; Example Threat Assessment;	12
Unit 3	Vulnerability Issues: Operating System Vulnerabilities; Application Vulnerabilities; Public Domain or Commercial Off-the-Shelf Software; Connectivity and Dependence; Vulnerability assessment for natural disaster, technological hazards, and terrorist threats; implications for emergency response, vulnerability of critical infrastructures;	8
Unit 4	The Risk Process: What is Risk Assessment? Risk Analysis; Who is Responsible?	8
Unit 5	Tools and Types of Risk Assessment: Qualitative and Quantitative risk Assessment; Policies, Procedures, Plans, and Processes of Risk Management; Tools and Techniques; Integrated Risk Management; Future Directions: The Future of the Risk Management.	

Suggested Readings :

1. Malcolm Harkins, Managing Risk and Information Security, Apress, 2012.
2. Daniel Minoli, Information Technology Risk Management in Enterprise Environments, Wiley, 2009.
3. Andy Jones, Debi Ashenden ,Risk Management for Computer Security: Protecting Your Network & Information Assets, , 1st Edition, Butterworth-heinemann, Elsevier, 2005.
4. Andreas Von Grebmer, Information and IT Risk Management in a Nutshell: A pragmatic approach to Information Security, 2008, Books On Demand Gmbh.



VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN

SCS801	INFORMATION MANAGEMENT	L	T	P	C
		3	0	0	3

Contents		Hours
Unit 1	DATABASE MODELLING, MANAGEMENT AND DEVELOPMENT Database design and modelling - Business Rules and Relationship; Java database Connectivity (JDBC), Database connection Manager, Stored Procedures. Trends in Big Data systems including NoSQL - Hadoop HDFS, MapReduce, Hive, and enhancements.	8
Unit 2	DATA SECURITY AND PRIVACY Program Security, Malicious code and controls against threats; OS level protection; Security – Firewalls, Network Security Intrusion detection systems. Data Privacy principles. Data Privacy Laws and compliance.	8
Unit 3	INFORMATION GOVERNANCE Master Data Management (MDM) – Overview, Need for MDM, Privacy, regulatory requirements and compliance. Data Governance – Synchronization and data quality management.	8
Unit 4	INFORMATION ARCHITECTURE Principles of Information architecture and framework, Organizing information, Navigation systems and Labelling systems, Conceptual design, Granularity of Content.	8
Unit 5	INFORMATION LIFECYCLE MANAGEMENT Data retention policies; Confidential and Sensitive data handling, lifecycle management costs. Archive data using Hadoop; Testing and delivering big data applications for performance and functionality; Challenges with data administration.	