



MTech in IT and Computing Areas with a Proposed Model in MTech in Information Assurance: *Indian Context*

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ABSTRACT

Information is the driving force in today's age. Each and every organizations and institutions depend on information and contents. For managing information and contents different tools and technologies are being used. The huge amount of information leads to the concepts of securing such information. Today computers are the most important tool for information related activities leading to collection, selection, organization, processing, management, and dissemination so its security is also an important concerned. Information Assurance is a field of study and practice responsible for data and information privacy including securing devices and systems holds information. The field is very close with few other domains viz. IT Security, information security, computer security, etc. Internationally many universities have started programs on Information Assurance and allied fields as a merged domain viz. Information Assurance and Cyber Security. Important to note that in India exact specialization on Information Assurance till not offered in any of the educational levels; though few universities have provided allied fields as a program of study. In India, IT and Computing Masters are available in two tracks; first as Science program viz. M.Sc. and another is MTech. In both, Information Assurance can be a new and innovative program as a super specialty or emerging field in IT. However, this paper is proposed on M.Tech. in Information Assurance and allied field with possible proposed curricula.

Keywords: Information Assurance, IT Management, Information Security, Data Governance, MTech- Information Assurance, Indian Universities

Information Assurance is a field of fields related to information and its issues related to privacy, security, etc. It is a broader field than other existing areas and responsible for various

techno managerial solutions of information privacy^{[1],[5],[9]}. It is dedicated to the designing, development, formulation of information security policy, guidelines, framework, etc. Moreover, the field is responsible for the practicing of IT Security solutions viz. Mobile Security, Cloud Security, Web Security, Database Security, etc.^{[2],[3],[22]}. Information Assurance as a term also got popularized in other different countries as well. In India, few subjects are available both as Science and Technology program (i.e. MSc and MTech) and among these few popular are Bio Technology, Information Technology, Computer Science, Electronics, etc. Hence, as Information Assurance is an area of Information Technology so that it could be offered both as MSc and Degree. And still, there is no program on MSc and MTech in Information Assurance in India. Thus this work is proposed for the potentiality of the MTech in Information Assurance with proposed model and curricula.

Objective and Agenda

The present paper is theoretical and conceptual in nature and deals with a policy framework on MTech in Information Assurance; thus deals with mainly the following agenda:

1. To learn about the basics of Information Assurance including its stakeholders and areas in brief.
2. To know about the features, function and advantages of Information Assurance so that it easy to understand regarding the requirement of MTech in Information Assurance.
3. To learn about the potential areas of Information Assurance and proposed MTech in Information Assurance in brief.
4. To learn and dig out the challenges, opportunities of Information Assurance programs especially the MTech in Information Assurance programs in India.

Information Assurance: Overview

Information Assurance is a discipline that concerns with information security and privacy management in different source and way. The field uses different tools, techniques, and strategies to protect information into its base or privacy^{[4],[6],[7]}. Moreover, it is responsible for the development and formulation of privacy related affairs not only with the electronic system but also manual information systems^{[6],[17],[18]}. The field, Information Assurance is growing rapidly and it is associated with management science due to its nature. The affairs of security and privacy related to the information having social, legal issues are the jurisdiction of Information Assurance^{[8],[10],[23]}. It is broader than Information Technology security, as it deals with managerial affairs and manual information security related issues as well^{[11],[12],[22]}. It is dedicated to the following and that's why the program of MTech in Information Assurance may be offered or started in Indian Universities—

- ❖ Information Assurance is a broader field and comprises all the popular areas of security viz. IT Security, Information Security, Cyber Security etc.^{[13],[15],[24]}.
- ❖ The managerial, social, legal affairs related to information security and privacy fall under the jurisdiction of Information Assurance^{[26],[27],[28]}.
- ❖ Information Assurance is also responsible for the manual information and content security^[30],
- ❖ Emerging technological security concerns viz. mobile security, cloud security, web security, network security. etc also fall under the area of Information Assurance^{[14],[16],[22]}.

Due to this status and importance of the Information Assurance the branch may be offered as MTEch program for the BTech/MSc Graduates. It is also suitable for MCA graduates interested in the security profession.

Information Assurance and Allied Education

Information Assurance as a branch established internationally and many universities have started programs on the allied and merged nomenclature also leading to Bachelor, Masters, Doctoral level leading to mainly BS, MS, and PhD Degree. Among the available nomenclature few important are^{[24],[25],[36]} —

- ❖ Information Assurance and Security
- ❖ Information Security and Privacy
- ❖ Information Assurance and Cyber Security
- ❖ Digital Assurance and Information Assurance etc.^{[21],[23],[29]}.

India and IA Education in Computing and Information Field

In India, Computing degrees are available with different nomenclatures and subjects viz. Computer Science, Computer Science and Engineering, Computer Applications, Information Technology, Information Science, etc.^{[19],[20],[25]}. And among these branches, CS, CSE and IT are available as MSc and MTEch degree as well. Computer Application is available as MCA Degree. And we know that Information Technology consists with different branches (*Web Technology, Database Technology, Network Technology, Multimedia Technology, etc.*) and in this regard, Information Assurance maybe fall under as a specialized field of IT and also offer MTEch in Information Assurance.

MTEch in IA: Indian Context

MTEch degree in India is popular for BTech students. As after 10+2 in India one can go for the BSc and BTech, so many students are pursuing BTech program in Information Technology,

Computer Science and Engineering and for them, MTech in Information Assurance may be a suitable degree. In this context, the degree may be offered into two approaches—

- ❖ In First Approach, the program may be offered as a Specialization of MTech-IT and may be offered as MTech-IT (Information Assurance).
- ❖ In the Second Approach, the program may be offered as a Full Fledged Degree as MTech-Information Assurance.

However, in first approach two styles may be adopted in one, the specialization on Information Assurance may be started from the first semester; while in second one, Information Assurance may be started from the third semester itself.

The table: 1 is depicted the proposed MTech-Information Technology (Information Assurance) model; here style one has been proposed where Information Assurance specialization has been started since first semester.

Table 1: Depicted the proposed MTech-Information Technology (Information Assurance)

Name of the proposed papers	Credit of the Paper	Lab [Yes/ No]	Industrial Training [Yes/No]
Semester 1			
Fundamentals of Information Technology with Computer Architecture	4	Yes	—
Information Assurance: Basics	4	No	—
Basics of Programming with C++	4	Yes	—
Fundamentals of Network Security with CISCO Routing Protocol	4	Yes	Maybe provided
Basics of Software Systems	4	No	—
Semester 2			
Basics of Big Data with Python	4	Yes	—
Basics of Database and Web Security	4	No	—
Cyber Crime in India	4	No	—
Network and Server Management with Microsoft Platform	4	Yes	Maybe provided
Advanced Network with Microsoft Platform	4	Yes	Maybe provided
Semester 3			
Data Science and Organizations	4	No	—
Digital Infrastructure and Security: Legal Context	4	No	—
Network Security Guidelines and Framework	4	No	—
IT Laws in India	4	No	—
Cloud Computing with Azure	4	Yes	Maybe provided

Semester 4			
Manual Contents and Security	4	No	___
Information Right, Privacy and Human Right	4	No	___
Security with CISCO	4	Yes	Maybe provided
Firewall Security	4	Yes	Maybe provided
Knowledge Management with Security Principles	4	No	___
Dissertation	5	Based on Topic	Based on Topic

Table 1 proposed model is suitable for the universities planning to offer the Information Assurance specialization of MTEch program from the first semester. While in the age of super specialty many universities are offering new age specialization viz. Cloud Computing, Big Data, etc. Hence, those institutes are planning to offer multiple specializations can adopt the second model which is depicted in Table 2.

Table 2: Depicted the proposed MTEch Information Technology (Information Assurance)

Name of the proposed papers	Credit of the Paper	Lab [Yes/ No]	Industrial Training [Yes/No]
Semester 1			
Fundamentals of Information Technology with Computer Architecture	4	No	___
Basics of Programming with C++	4	Yes	___
Basics of Software Systems & Data Structure	4	Yes	___
Basics of Management & Mathematics	4	No	___
Emerging IT	4	No	___
Semester 2			
Basics of Big Data with Python	4	Yes	___
Basics of Database Technology with SQL	4	Yes	___
Basics of Network Technology	4	No	___
Operating Systems with MS Server Administration	4	Yes	___
Internet and Web Systems	4	Yes	___
Semester 3			
Information Assurance: Basics	4	No	___
Fundamentals of Network Security with CISCO Routing Protocol	4	Yes	Maybe provided
Network and Server Management with Microsoft Platform	4	Yes	Maybe provided
Digital Infrastructure and Security: Legal Context	4	No	___
IT Laws in India	4	No	___

Semester 4			
Knowledge Management with Security Principles	4	No	—
Advanced Network with Microsoft Platform	4	Yes	Maybe provided
Manual Contents and Security	4	No	Maybe provided
Information Right, Privacy and Human Right	4	No	—
Firewall Security	4	Yes	Maybe provided
Dissertation	5	Based on Topic	Based on Topic

Here first two semesters are general concerning with the Information Technology field whereas rest two semesters are concerning with specialization of Information Assurance. Here each semester is proposed with 20 Credit where each course is proposed with 4 credit and 5 courses in each semester. Importantly, there is a mix of theoretical and applied courses from IT and the same approach in specialization i.e. (mix of theoretical and applied courses). As the Information Assurance is broad and interdisciplinary in nature so that for the skill based areas may be conducted as industrial training or tie-up. The dissertation can be undertaken in the area of technical security and managerial security based on the requirement of the student. However, if the university is interested to offer full-fledged degree on MTech in Information Assurance then table 3 is the for such approach.

Table 3: Depicted the proposed MTech Information Assurance

Name of the proposed papers	Credit of the Paper	Lab [Yes/ No]	Industrial Training [Yes/No]
Semester 1			
Fundamentals of Information Technology with Computer Architecture	4	No	—
Basics of Information Assurance	4	No	—
Basics of Network Technology	4	No	—
Fundamentals of Network Security with CISCO Routing Protocol	4	Yes	Maybe provided
Information Security Policy	4	No	—
Semester 2			
Basics of Database Technology with SQL	4	Yes	—
Operating Systems with MS Server Administration	4	Yes	Maybe provided
Internet and Web Systems	4	Yes	—
Basics of Big Data with Python	4	Yes	—
IT Laws in India	4	No	—

Semester 3			
Network and Server Management with Microsoft Platform	4	Yes	Maybe provided
Digital Infrastructure and Security: Legal Context	4	No	Maybe provided
Ethical Hacking and SQL Injection	4	Yes	Maybe provided
Web Security	4	No	—
Knowledge Management with Security Principles	4	No	—
Semester 4			
Cisco Cloud Security	4	Yes	Maybe provided
Advanced Network with Microsoft Platform	4	Yes	Maybe provided
Manual Contents and Security	4	No	—
Information Right, Privacy and Human Right	4	No	—
Firewall Security	4	Yes	Maybe provided
Dissertation	5	Based on Topic	Based on Topic

In all these proposed model on Information Assurance, almost all the important areas have been incorporated from technical security related areas viz. Cloud Security, Network Security, Web Security, Database Security, Cloud Computing, Cisco Basics routing switching and security modules, Microsoft server administration to Security related affairs, Firewall security has been also proposed with checkpoint based on the current trend. As the proposed program is not IT Security it is Information Assurance so techno managerial areas and traditional content security courses also been proposed.

Issues and Challenges

- ❖ India is the largest education hub in the world having a different type of educational institutes including numerous engineering institutes, but still, there are issues to find out the proper skill and knowledge focused institute.
- ❖ In the proposed models, the first two are suitable for the existing institutes offering MTEch program in IT and Computing related areas. But unwillingness is a major challenge.
- ❖ Information Assurance as a theoretical and skill based domain requires interdisciplinary human resources on its faculty team.
- ❖ The developed universities may have different faculties viz. Law, Management, Social Sciences and from there the managerial courses may be offered if expertise exists. But many faculty from such stream may not be interested to enter the system.
- ❖ For the skill based areas viz. Cloud Security, Network Security, Web Security, Database Security, Cloud Computing, Cisco Basics routing switching, etc, industrial tie-ups may

be good but there are huge challenges to incorporate this due to non-interest, financial issues, collaboration, etc.

- ❖ Initially, universities can start the program as there is a huge skilled expert requirement in cyber securities, information security professionals.
- ❖ Information Assurance is a policy making field also in the security and privacy related domain and thus there should be proper interaction with the policy makers, policy making institutes, etc.^{[30],[32],[34]}.

CONCLUSION

India holds a large amount of Higher Educational Institutes, and among these, there are good numbers of engineering colleges and institutes^{[29],[31],[33]}. With adopting proper policies and strategies these institutes can easily start MTech in Information Assurance or MTech with Information Assurance Specialization. Moreover, the proper industrial tie-up would be good for the healthy and sophisticated knowledgeable product output. In India, huge numbers of Engineering institutes are offering MTech programs in Information Technology, Computer Science and Engineering and easily Information Assurance major can be started in this branch. UGC, AICTE models should also be followed to offer such programs.

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