

Department of Computer Sc. & Engg. and Information Technology
Minor Program in CSE

Minor program in CSE consist the following major disciplines in which student has to complete 14 mandatory credits and 6 non-mandatory credits to complete total 20 additional credits.

Subject Code	Type	Semester	Name of the Subject(s)	Credits
18B11CI412	Mandatory	4	Design & Analysis of Algorithms	3
18B17CI472	Mandatory	4	Design and Analysis of Algorithms Lab	2
18B11CI513	Mandatory	5	Formal Language & Automata Theory	3
18B1WCI575	Mandatory	5	Multimedia Lab	1
18B11CI612	Mandatory	6	Compiler Design	3
18B17CI672	Mandatory	6	Compiler Design Lab	2
18B1WCI733	Non-Mandatory	7	Advanced Algorithms	2
18B1WCI773	Non-Mandatory	7	Advanced Algorithms Lab	1
18B1WCI740	Non-Mandatory	7	Computational Techniques and Algorithms in Engineering	3
18B1WCI834	Non-Mandatory	8	Network Management	3
18B1WCI831	Non-Mandatory	8	Data Analytics	3
			TOTAL	14+6

Minor program in IT

Minor program in IT consist the following major disciplines in which student has to complete 14 mandatory credits and 6 non-mandatory credits to complete total 20 additional credits.

Category Code	Type	Semester	Name of the Subjects	Credits
18B1WCI639	Mandatory	4	Software Engineering Practices	3
18B1WCI679	Mandatory	4	Software Engineering Practices Lab	2
18B11CI512	Mandatory	5	Information Systems	3
18B17CI572	Mandatory	5	Information Systems Lab	1
18B11CI613	Mandatory	6	Data Mining	3
18B17CI673	Mandatory	6	Data Mining Lab	2
	Non-Mandatory	7	Building IoT and Network Applications	2
	Non-Mandatory	7	Building IoT and Network Applications Lab	1
	Non-Mandatory	7	An Introduction to Statistical learning	3
	Non-Mandatory	8	Foundations of Blockchain	3
	Non-Mandatory	8	Fog Computing in IoT	3
			TOTAL	14+6

Proficiency Courses in CSE & IT Discipline

Proficiencies proposed and the elective courses relevant to each proficiency are outlined below. A student is required to take 50% of the electives in the regular curricula from the list of courses prescribed for each proficiency.

i. Proficiency in Information Security

As digital information moves to a more networked and globalized infrastructure, it is essential that one should understand the threats to this information. The creation of effective corporate- wide security plans with well established security programs, policies, controls, and procedures as well as awareness and training initiatives is getting more focus with the rising demand of Information security professionals.

Proficiency in Information security consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credits
Elective -1	18B1WCI532	5th Sem	Data Compression	2
Elective -1	18B1WCI572	5th Sem	Data Compression Lab	1
Elective -2	19B1WCI631	6th Sem	Digital Forensics	2
Elective -2	19B1WCI671	6th Sem	Digital Forensics lab	1
Elective -3	19B1WCI632	6th Sem	Information Security	2
Elective -3	19B1WCI672	6th Sem	Information Security Lab	1
Elective -4	18B1WCI734	7th Sem	Cryptography & network security	2
Elective -4	18B1WCI774	7th Sem	Cryptography & network security Lab	1
Elective -5	19B1WCI736	7th Sem	Information Auditing & Risk Management	3
Elective -6	19B1WCI831	8th Sem	Ethics and Information Technology	3

ii. Proficiency in Data Sciences

Unlike classical statistics, the need to process and manage massive amounts of data has become a key feature of modern statistics. Data Science provides a foundation for problem- solving in a data-driven society. Data Science applies core concepts in computer science, statistics and mathematics to problems in a wide variety of fields, from physical, social, biomedical, and behavioral sciences to arts and humanities. This proficiency will enable students with preliminary data collection, manipulation, access and/or analysis skills as are appropriate to data needs in their majors.

Proficiency in Data Sciences consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credits
Elective -1	20B1WCI531	5th Sem	Foundation for Data Science and Visualization	2
Elective -1	20B1WCI571	5th Sem	Data Science and Visualization Lab	1
Elective -2	18B1WCI634	6th Sem	Machine Learning	2
Elective -2	18B1WCI674	6th Sem	Machine Learning Lab	1
Elective -3	20B1WCI732	6th Sem	From Graph to Knowledge Graph	2
Elective -3	20B1WCI772	6th Sem	From Graph to Knowledge Graph Lab	1
Elective -4	19B1WCI731	7th Sem	Computational Data Analysis	2
Elective -4	19B1WCI771	7th Sem	Computational Data Analysis lab	1
Elective -5	19B1WCI737	7th Sem	Optimization Methods in Business Analytics	3
Elective -6	18B1WCI832	8th Sem	Social and Information Network Analysis	3

iii. Proficiency in Machine Learning

Rising demand of Machine learning (ML) have exploded in importance in recent years and garnered attention in a wide variety of application in diverse areas such as bioinformatics, fraud detection, intelligent systems, perception, finance, information retrieval, and other areas. This proficiency will allow undergraduates to learn about the core principles of machine learning.

Proficiency in machine learning consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	20B1WCI531	5th Sem	Foundation for Data Science and Visualization	2
Elective -1	20B1WCI571	5th Sem	Data Science and Visualization Lab	1
Elective -2	18B1WCI634	6th Sem	Machine Learning	2
Elective -2	18B1WCI674	6th Sem	Machine Learning Lab	1
Elective -3	18B1WCI635	6th Sem	Data Mining & Data Warehousing	2
Elective -3	18B1WCI675	6th Sem	Data Mining & Data Warehousing Lab	1
Elective -4	18B1WCI734	7th Sem	Cryptography & network security	2
Elective -4	18B1WCI774	7th Sem	Cryptography & network security Lab	1
Elective -5	19B1WCI736	7th Sem	Information Auditing & Risk Management	3
Elective -6	19B1WCI832	8th Sem	Probabilistic Graphical Models	3

iv. Proficiency in Computer Graphics

Computer Graphics provides an exciting and rapidly developing industry with myriad opportunities for working in film and TV, scientific and medical visualisation, computer games and the web. This proficiency will allow undergraduates to focus on producing computer-generated graphics and is particularly useful for those interested in animation, and game designing.

Proficiency in computer graphics consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	20B1WCI531	5th Sem	Foundation for Data Science and Visualization	2
Elective -1	20B1WCI571	5th Sem	Data Science and Visualization Lab	1
Elective -2	19B1WCI633	6th Sem	Computer Animation	2
Elective -2	19B1WCI673	6th Sem	Computer Animation Lab	1
Elective -3	18B1WCI636	6th Sem	Digital Image processing	2
Elective -3	18B1WCI676	6th Sem	Digital Image processing Lab	1
Elective -4	19B1WCI732	7th Sem	Game Development and Design	2
Elective -4	19B1WCI772	7th Sem	Game Development Lab	1
Elective -5	18B1WCI840	7th Sem	Computer Vision	3
Elective -6	19B1WCI833	8th Sem	Information Modeling	3

v. ***Proficiency in Big Data and Visual Analytics***

Big Data and Business Analytics is a fast growing field with applications in business decision making, patient care, political decision making, criminal justice, IT security etc. This proficiency provides knowledge of key concepts, methods, techniques, and tools of big data and visual analytics from organization perspective to the various undergraduates.

Proficiency in big data and visual analytics consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	19B1WCI531	5th Sem	Big Data using Hadoop	2
Elective -1	19B1WCI571	5th Sem	Big Data using Hadoop Lab	1
Elective -2	18B1WCI634	6th Sem	Machine Learning	2
Elective -2	18B1WCI674	6th Sem	Machine Learning Lab	1
Elective -3	18B1WCI635	6th Sem	Data Mining & Data Warehousing	2
Elective -3	18B1WCI675	6th Sem	Data Mining & Data Warehousing Lab	1
Elective -4	19B1WCI731	7th Sem	Computational Data Analysis	2
Elective -4	19B1WCI771	7th Sem	Computational Data Analysis lab	1
Elective -5	19B1WCI738	7th Sem	Introduction to Deep Learning	3
Elective -6	19B1WCI834	8th Sem	Information Visualization	3

vi. ***Proficiency in Image Analysis and Processing***

Recent explosive growth of digital imaging technology makes the problems of automated image interpretation more exciting and relevant than ever. Image analysis and processing is a highly interdisciplinary field of study that incorporates elements from mathematics, engineering, and computer science to understand, design, and utilize imagery and imaging systems to study scientific phenomena. This proficiency provides knowledge of modern methods of automatic processing and analysis of digital images and video, and methods of image understanding and computer vision to the various undergraduates.

Proficiency in image analysis and processing consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	19B1WCI532	5th Sem	Image Analysis and Pattern Recognition	2
Elective -1	19B1WCI572	5th Sem	Image Analysis and Pattern Recognition Lab	1
Elective -2	19B1WCI634	6th Sem	Computer and Robot Vision	2
Elective -2	19B1WCI674	6th Sem	Computer and Robot Vision lab	1
Elective -3	18B1WCI636	6th Sem	Digital Image processing	2
Elective -3	18B1WCI676	6th Sem	Digital Image processing Lab	1
Elective -4	20B1WCI731	7th Sem	Artificial Intelligence	2
Elective -4	20B1WCI771	7th Sem	Artificial Intelligence Lab	1
Elective -5	18B1WCI840	7th Sem	Computer Vision	3
Elective -6	19B1WCI834	8th Sem	Information Visualization	3

vii. Proficiency in Cloud Computing

With the wide usage of Internet and the increasing popularity of mobile computing devices (e.g. smartphones, tablets, and laptops) in society, computer users are migrating their computing usage and data storage from a single personal computing environment to a web- based, distributed and networked computing environment. This proficiency will equip undergraduates with the essential knowledge of cloud computing and various tools and technologies.

Proficiency in cloud computing consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	20B1WCI532	5th Sem	Cloud Computing: Concepts, Technology & Architecture	2
Elective -1	20B1WCI572	5th Sem	Cloud Computing: Concepts, Technology & Architecture Lab	1
Elective -2	18B1WCI634	6th Sem	Machine Learning	2
Elective -2	18B1WCI674	6th Sem	Machine Learning Lab	1
Elective -3	19B1WCI635	6th Sem	Architecting Distributed Cloud Applications	2
Elective -3	19B1WCI675	6th Sem	Architecting Distributed Cloud Applications Lab	1
Elective -4	20B1WCI731	7th Sem	Artificial Intelligence	2
Elective -4	20B1WCI771	7th Sem	Artificial Intelligence Lab	1
Elective -5	18B1WCI736	7th Sem	Storage Networks	3
Elective -6	19B1WCI835	8th Sem	Cloud Computing Security	3

viii. Proficiency in Human Computer Interaction

Human-Computer Interaction (HCI) is the study of how humans interact with technology through principled design, communication, and construction. HCI addresses the design, evaluation, and implementation of computer based systems for the benefit of human use. This proficiency provides undergraduates core knowledge about techniques for building successful user interfaces.

Proficiency in human computer interaction consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	19B1WCI533	5th Sem	Human-Computer Interaction	2
Elective -1	19B1WCI573	5th Sem	Human-Computer Interaction Lab	1
Elective -2	19B1WCI636	6th Sem	Computability, Complexity & Algorithms	2
Elective -2	19B1WCI676	6th Sem	Computability, Complexity & Algorithms Lab	1
Elective -3	18B1WCI638	6th Sem	Pattern Recognition	2
Elective -3	18B1WCI678	6th Sem	Pattern Recognition Lab	1
Elective -4	20B1WCI731	7th Sem	Artificial Intelligence	2
Elective -4	20B1WCI771	7th Sem	Artificial Intelligence Lab	1
Elective -5	18B1WCI840	7th Sem	Computer Vision	3
Elective -6	19B1WCI836	8th Sem	Knowledge-Based AI: Cognitive Systems	3

ix. Proficiency in Artificial Intelligence

With the rapid increase in data volumes, advanced algorithms, and improvements in computing power and storage have made possible for machines to learn from experience and perform human-like tasks. Artificial Intelligence has fulfilled this dream which can be applied to almost every field. This proficiency introduces students to the techniques of artificial intelligence programming and the basic theoretical concepts of artificial intelligence, knowledge representation, and automated reasoning.

Proficiency in artificial intelligence consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	20B1WC1531	5th Sem	Foundation for Data Science and Visualization	2
Elective -1	20B1WC1571	5th Sem	Data Science and Visualization Lab	1
Elective -2	18B1WC1634	6th Sem	Machine Learning	2
Elective -2	18B1WC1674	6th Sem	Machine Learning Lab	1
Elective -3	19B1WC1637	6th Sem	Statistics and Exploratory Data Analytics	2
Elective -3	19B1WC1677	6th Sem	Statistics and Exploratory Data Analytics Lab	1
Elective -4	20B1WC1731	7th Sem	Artificial Intelligence	2
Elective -4	20B1WC1771	7th Sem	Artificial Intelligence Lab	1
Elective -5	19B1WC1738	7th Sem	Introduction to Deep Learning	3
Elective -6	19B1WC1837	8th Sem	Reinforcement Learning	3

x. Proficiency in Social Computing

The collaborative exchange of ideas is essential to the success of difficult initiatives, including software architecture and design, project management and organizational transformation. Technology has made collaboration at a distance possible in new ways that present their own set of challenges. Social computing is concerned with systems of this sort and the mechanisms and principles that underlie them. This proficiency introduces undergraduates to the major challenges and opportunities for creating online communities.

Proficiency in social computing consist the following major disciplines:

Elective	Course Code	Semester	Name of the Subjects	Credit
Elective -1	19B1WC1534	5th Sem	Social Media	2
Elective -1	19B1WC1574	5th Sem	Social Media Lab (Node XL)	1
Elective -2	19B1WC1638	6th Sem	Statistics and Data Science	2
Elective -2	19B1WC1678	6th Sem	Statistics and Data Science Lab	1
Elective -3	20B1WC1732	6th Sem	From Graph to Knowledge Graph	2
Elective -3	20B1WC1772	6th Sem	From Graph to Knowledge Graph Lab	1
Elective -4	20B1WC1731	7th Sem	Artificial Intelligence	2
Elective -4	20B1WC1771	7th Sem	Artificial Intelligence Lab	1
Elective -5	18B1WC1737	7th Sem	Cloud Computing	3
Elective -6	18B1WC1832	8th Sem	Social and Information Network Analysis	3