CONCENTRATIONS MAPPING TO ELECTIVE COURSES FOR SOFTWARE ENGINEERING (132 Cr.) UNDERGRADUATE

Concentration Courses	Mapped To
Concentration course I	SWE Major Elective I
Concentration course II	SWE Major Elective II
Concentration course III	SWE Major Elective III
Concentration course IV	XE xxx I

In case the concentration had a re-requisite course, it will be mapped as follows:

Concentration Pre-Requisite	Mapped To
Concentration pre-requisite course	XE xxx II

In summary , the mapping will be as follows:
- Four Concentration courses will be mapped to three Major electives and one free elective.
- Concentration pre-requisite course will be mapped to a second free elective.

The committee applied to proposed concentration to all concentrations.

1) Artificial Intelligence and Machine Learning Concentration

This interdisciplinary concentration covers artificial intelligence and machine learning. It will provide the students with the required knowledge to develop intelligent techniques and systems. Students are exposed to topics such as machine learning, deep learning, computer vision, and natural language processing. Furthermore, it also covers perception, motion and manipulation, and reinforcement learning. It promotes interdisciplinary education where computer science intersects with mathematics and engineering. The applications of this concentration are wide-ranging and include automatic image and video processing, healthcare, financial data and trading, speech recognition, facial identification, and seismic survey processing.

Host: ICS

Concentration Courses	Mapped To
ICS 471: Artificial Neural Networks and Deep Learning	SWE Major Elective I
ICS 485: Machine learning	SWE Major Elective II
ICS 483: Computer Vision	SWE Major Elective III
ICS 489: Applications of Machine Learning	XE xxx I

Concentration Pre-Requisite	Mapped To
ICS 381: Principles of Artificial Intelligence	XE xxx II

2) Cybersecurity and Blockchain Concentration

This interdisciplinary program covers topics related to secure and trusted computing, including data and information assurance, identification of cyber assets and related security risks and threats, measurement of system resilience against cyber-attacks, and security policy compliance and governance. Students learn the fundamental pillars of computer security and data privacy and how they affect complex engineering systems (e.g. manufacturing plants). Topics include cryptology, access control models and mechanisms, intrusion detection systems, and integrity verification mechanisms. Students also learn the fundamentals of blockchain technology, including record and hash replication, and types of blockchains (public, private, and hybrid), as well the applications in cryptocurrency and various other scientific, engineering, and business use cases.

Host: ICS

Concentration Courses	Mapped To
ICS 440: Cryptography and Blockchain Applications	SWE Major Elective I
ICS 442: Penetration Testing and Ethical Hacking	SWE Major Elective II
SWE 445: Secure Software Development	SWE Major Elective III
COE 426: Data Privacy	XE xxx I

3) Computer Networks Concentration

The concentration is designed to introduce students to wired/wireless computer networks, design aspects of computer networks, network management and security and internet and cloud engineering.

Host: COE

Concentration Elective Courses	Mapped To
ICS 445 Network Management and Security	SWE Major Elective I
COE 446 Mobile Computing	SWE Major Elective II
COE 453 Cloud and Edge Computing	SWE Major Elective III
COE 444 Network Design	XE xxx I

4) Internet of Things Concentration

This interdisciplinary program covers connected smart systems capable of sensing, actuation, and computing. Internet of things (IoT) is the enabling technology behind many vital applications such as smart homes, smart cities, and smart transportation systems. Smart objects can act and interact without human intervention which paves the way for an endless range of applications. Topics covered include IoT system and network architectures, embedded systems and sensors, IoT communication protocols, Industrial Internet of Things, wireless sensor networks, cloud computing, big data analytics, and security. Students are introduced to embedded systems that can be programmed to monitor and control other objects and used to build smart applications such as smart homes. Students also learn technologies that allow smart objects to connect to one another as well as to the cloud. Using big data analytics, students can use advanced analytics to process sensor data and build innovative applications.

Host: COE

Concentration Elective Courses	Mapped To
COE 450: Introduction to Smart Systems	SWE Major Elective I
ICS 474: Big Data Analytics	SWE Major Elective II
CISE 464: Industrial Internet of Things Technology	SWE Major Elective III
COE 454: Internet of Things	XE xxx I

Concentration Pre-Requisite	Mapped To
EE 236: Electronic Circuits	XE xxx II

5) Decision Analytics Concentration

The interdisciplinary field of Decision Analytics (DA) seeks to understand and improve the judgment and decision making of individuals, groups, and organizations. Decision Analytics is grounded in theories and methods drawn from mathematics, probability and statistics, operations research, optimization, and artificial intelligence-based tools such as machine learning. The knowledge of this multidisciplinary area can be applied almost everywhere including government, manufacturing, design, health care, transportation, city planning, and business. The Systems Engineering department proposes a concentration in DA with the aim to equip students with the knowledge and skills for scientific decision making.

Host: ISE

Concentration Elective Courses	Mapped To
ISE 447: Decision Making	SWE Major Elective I
ICS 487: Intelligent Decision Support Systems	SWE Major Elective II
ISE 453: Applied Game Theory	SWE Major Elective III
ISE 455: Cases in Decision Analytics	XE xxx I

Concentration Pre-Requisite	Mapped To
ISE 303	XE xxx II