**AIE501 Seminar**

This course aims for graduate students to gain in-depth knowledge in their research areas and to share this knowledge in an academic setting. Students prepare presentations on topics they have identified through literature reviews and present these to their classmates and faculty members.

**AIE533 Algorithms and Programming**

This course provides an in-depth exploration of algorithms and programming techniques. Students will gain experience in designing, analyzing, and implementing algorithms to solve computational problems efficiently. The course emphasizes practical programming skills and theoretical understanding necessary for advanced computing tasks.

**AIE534 Object Oriented Programming**

This course introduces the principles and practices of object-oriented programming (OOP). Students will learn about the core concepts of OOP, such as encapsulation, inheritance, and polymorphism, and how to apply these principles to design and implement robust, maintainable software systems. The course will cover key OOP techniques using one or more programming languages such as Java, C++, or Python.

**AIE503 Introduction to AI Engineering**

This course covers the foundations of AI, including its history, fundamental concepts, and current trends. Students will learn problem-solving techniques for search, optimization, and reasoning. The course introduces machine learning, covering supervised, unsupervised, and reinforcement learning. Students will also get an overview of common AI development tools and platforms and discuss the ethical considerations and societal impact of AI.

**AIE505 Image Processing**

In this course, students will learn the basics of digital image representation and manipulation. The course covers techniques for image enhancement to improve quality and methods for image restoration. Students will explore approaches for image segmentation, partitioning images into meaningful regions, and feature extraction techniques to identify important features within images.

**AIE507 Automata Theory**

This course introduces students to the basic concepts of finite automata, regular languages, and expressions. It covers the study of context-free languages and pushdown automata. The course also introduces Turing machines and the concept of computability. Students will explore decidable and undecidable problems and learn the basics of computational complexity and complexity classes.

**AIE509 Data Mining and Big Data**

Students will learn the fundamental principles of data mining and knowledge discovery in this course. It covers techniques for cleaning and preparing data and methods for discovering associations and classifying data. The course explores approaches for clustering data and identifying anomalies. Students will also get an overview of big data technologies and tools like Hadoop and Spark.

**AIE511 Graphics and Visualization**

This course covers the basics of computer graphics and graphical systems. Students will learn techniques for creating and manipulating 2D and 3D images. The course covers methods for rendering realistic images and approaches for visualizing complex data. Practical applications of graphics and visualization in various fields will also be discussed.

**AIE513 Human Robot Interaction**

Students will be introduced to the basics of Human-Robot Interaction (HRI) and its importance. The course covers techniques for verbal and non-verbal communication between humans and robots. Students will learn principles for designing user-friendly robot interfaces and consider the social and ethical implications of HRI. The course also includes examination of real-world HRI applications and research through case studies.

**AIE515 Design of AI Systems**

This course covers the fundamentals of designing AI systems. Students will learn techniques for analyzing and specifying system requirements. The course explores approaches for designing AI system architectures and best practices for implementing and testing AI systems. Methods for managing AI system development projects are also discussed.

**AIE504 Machine Learning**

This course covers the fundamental concepts and techniques of machine learning. Students will learn about supervised learning, including regression and classification algorithms. The course also explores unsupervised learning methods such as clustering and dimensionality reduction. Students will gain practical experience through hands-on projects and learn about model evaluation, validation techniques, and the application of machine learning to real-world problems.

**AIE506 Decision Making and Robotics**

In this course, students will learn about the principles of decision making in robotics. The course covers algorithms and techniques for robotic planning, control, and optimization. Students will study topics such as Markov decision processes, reinforcement learning, and sensor-based decision making. The course includes practical applications and case studies to illustrate the integration of decision-making algorithms in robotic systems.

**AIE508 Embedded Systems**

This course introduces students to the design and implementation of embedded systems. Students will learn about the hardware and software components of embedded systems and their integration. The course covers microcontrollers, real-time operating systems, and embedded software development. Students will gain hands-on experience through lab exercises and projects, focusing on the development of embedded applications for various domains.

**AIE510 Deep Learning**

This course delves into deep learning techniques and architectures. Students will study neural networks, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and advanced models such as generative adversarial networks (GANs). The course covers training techniques, optimization methods, and the application of deep learning to tasks such as image recognition, natural language processing, and generative modeling. Students will work on practical projects to implement and experiment with deep learning models.

**AIE512 Natural Language Processing**

In this course, students will learn about the techniques and algorithms used in natural language processing (NLP). The course covers text processing, tokenization, syntactic and semantic analysis, and machine translation. Students will study state-of-the-art models for NLP tasks, including transformers and BERT. The course includes practical assignments and projects to apply NLP techniques to real-world text data.

**AIE514 Advanced Machine Learning**

This course covers advanced topics in machine learning beyond the fundamentals. Students will explore techniques such as ensemble methods, kernel methods, and advanced optimization algorithms. The course also includes a study of probabilistic graphical models, Bayesian methods, and the latest research trends in machine learning. Students will engage in research projects and presentations to deepen their understanding of advanced machine learning concepts and applications.

**AIE530 Graduation Project**

AIE530 is a course designed for students to apply their acquired knowledge and skills to a substantial research or practical project in the field of Artificial Intelligence and Engineering. Students will undertake a project that demonstrates their ability to integrate theoretical concepts with practical application, culminating in a final report and presentation.

**AIE502 M.Sc. Thesis**

This course involves graduate students conducting comprehensive research on a chosen topic under the guidance of their advisors and writing a thesis.