	INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) **FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS** **DEPARTEMEN TEKNIK ELEKTRO** **Program Studi Magister (S2) Teknik Elektro**

1	**Nama Mata Kuliah / *Course Name***	:	Komputasi Lunak / *Soft Computing*
2	**Course Code**	:	EE235152
3	**Kredit / *Credits***	:	3 SKS
4	**Semester / *Semester***	:	1

Deskripsi Mata Kuliah / *Course Description*

Pada mata kuliah ini, mahasiswa akan mempelajari pembelajaran mesin yang terinspirasi dari domain biologi. Topik yang akan dipelajari antara lain: tipe dasar neural network, multi layer perceptron, unsupervised neural network, fuzzy logic, dan genetic algorithm. Metode pembelajaran yang digunakan adalah kuliah/ceramah, diskusi, reading, penyelesaian soal-soal latihan, kuis, studi kasus, ujian, dan proyek akhir.

In this course, students will learn machine learning inspired by the biological domain. Topics to be studied include: basic types of neural networks, multi-layer perceptrons, unsupervised neural networks, fuzzy logic, and genetic algorithms. The learning methods used are lectures, discussions, reading, solving practice questions, quizzes, case studies, exams, and final projects.

Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah / *Program Learning Outcomes Charged to The Course*

1. (CPL-01) Mampu menunjukkan sikap dan karakter yang mencerminkan: ketakwaan kepada Tuhan Yang Maha Esa, berbudi pekerti luhur, peka dan peduli terhadap masalah sosial dan lingkungan, menghargai perbedaan budaya dan kemajemukan, menjunjung tinggi penegakan hukum, mendahulukan kepentingan bangsa dan masyarakat luas, melalui inovasi, kreatifitas, dan potensi lain yang dimiliki.

   (PLO-01) Able to demonstrate attitudes and characters that reflect: devotion to God Almighty, noble character, sensitivity and concern for social and environmental issues, respect for cultural differences and diversity, uphold law enforcement, prioritize the interests of the nation and the wider community, through innovation, creativity, and other potentials possessed.

2. (CPL-02) Mampu mengembangkan dan memecahkan permasalahan ipteks dalam bidang keilmuannya melalui riset dengan pendekatan inter atau multidisiplin

hingga menghasilkan karya inovatif dan teruji, serta mendapat pengakuan nasional dan internasional.

(PLO-02) Able to develop and solve science and technology problems in their scientific fields through research with an inter or multidisciplinary approach to produce innovative and tested work, and receive national and international recognition.

3. (CPL-04) Mampu menguasai konsep, prinsip keilmuan secara komprehensif, prinsip rekayasa, dan pengetahuan faktual tentang Teknologi Informasi untuk mengembangkan prosedur dan strategi yang diperlukan pada analisis dan perancangan sistem terkait bidang Teknik Elektro.

   (PLO-04) Able to master concepts, scientific principles comprehensively, engineering principles, and factual knowledge about Information Technology to develop procedures and strategies required in the analysis and design of systems related to the field of Electrical Engineering.

Capaian Pembelajaran Mata Kuliah / *Course Learning Outcomes*

1. Menguasai konsep komputasi lunak, jaringan saraf tiruan, fuzzy logic, dan evolutionary algorithm / *Mastering the concepts of soft computing, artificial neural networks, fuzzy logic, and evolutionary algorithms*
2. Mampu mengidentifikasi dan memilih teknologi komputasi lunak yang tepat untuk memecahkan masalah dan membangun pemecahannya / *Able to identify and select the right soft computing technology to solve problems and build solutions*
3. Mengimplementasikan komputasi lunak untuk memecahkan masalah. / *Implementing soft computing to solve problems.*
4. Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri / *Demonstrating a responsible attitude towards work in their field of expertise independently*
5. Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki. / *Working together to be able to maximize the potential they have.*

Pokok Bahasan / *Contents*

1. Neural Network: konsep neural network; supervised learning: perceptron dan multilayer perceptron; unsupervised learning: self-organizing map, Hopfield, ART. / *Neural Network: neural network concept; supervised learning: perceptron and multilayer perceptron; unsupervised learning: self-organizing map, Hopfield, ART.*
2. Fuzzy Logic: teori himpunan fuzzy, sistem fuzzy, fungsi keanggotaan, rule based, dan inference engine development. / *Fuzzy Logic: fuzzy set theory, fuzzy systems, membership functions, rule based, and inference engine development.*
3. Evolutionary Algorithm: genetic algorithm, genetic programming, metode ant colony, particle swarm optimization, artificial immune system. / *Evolutionary Algorithm: genetic algorithm, genetic programming, ant colony method, particle swarm optimization, artificial immune system.*

4. Hybrid Algorithm: metode neuro-fuzzy, metode neuro-ga, metode fuzzy-ga, immune- evolutionary. / *Hybrid Algorithm: neuro-fuzzy method, neuro-ga method, fuzzy-ga method, immune- evolutionary.*

Prasyarat / *Pre-requisite*

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Pustaka / *Reference*

Utama / *Primary*:

1. Mauridhi Hery Purnomo. ”Supervised Learning Neural Networks” Graha Ilmu. 2006
2. Jang JSR. “ Neuro Fuzzy & Soft Computing” Prentice Hall, 1997

Pendukung / *Supporting*:

1. Witten, I. H. (2017). Data Mining (Fourth Edition). In Practical Machine Learning Tools and Techniques.
2. Meier, A., & Schütze, R. (2014). Introduction to Fuzzy Logic & Intuitionistic Fuzzy Logic.
3. Fosch-Villaronga, E., & Deukarch, H. (2022). AI for Healthcare Robotics. CRC Press.