

TGGS Electrical and Softwaresystems Engineering Course Descriptions and Schedule for Semester 1 August-December

SSE=Software Sytems, EPE=Electrical Power, CE=Communications, SGE=Smartgrid all with the suffix "Engineering"

This document provides inofficial information only and the list is subject to change. If you need further assistance, please contact sarinrat.s@tggs.kmutnb.ac.th

Semester1	SSE	AM	PM	Course Descriptions
Aug-Dec	Mon	Advanced Mathematics in Electrical Engineering		Probability theory. Random variables. Stochastic processes. Failure statistics. Fourier transformations. Control theory. Optimization. Artificial intelligence. Data analytics. Linear algebra.
	Tue	Communication Protocols		see CE
			Digital Image Processing	Introduction to digital image processing, image color conversion, image thresholding, image enhancement, noise reduction and restoration, image sampling and quantization, image segmentation, edge detection, morphological image processing, image filtering and correlation, image transforms such as discrete Fourier transform (DFT) and discrete cosine transform (DCT), feature extraction, image recognition, image registration, image classification.
	Thr	Computer Graphics		An introduction to computer graphics, understanding of the background and concepts of 2D and 3D computer graphics technologies, using standard 2D and 3D graphics libraries for efficient graphics content generation.
	Fri	Software Engineering		Software development process, defining and formulating requirements, concept and principles of architecture modeling, techniques for coding robust programs, important software equality, software project management techniques.

Semester1	EPE	AM	PM	Course Descriptions
Aug-Dec	Mon	Advanced Mathematics in Electrical Engineering		see SSE
	Tue	Renewable Energies for Electrical Power Generation		Potentials, technologies. opportunities and threats of using renewable energies for electrical power generation. technologies and sources for renewable energy conversion into electrical power. Photovoltaic. wind power. hydro power and solar thermal power. biomass and biogas. geothermal power and ocean power; electrical energy storage. integration of electrical power generation by renewable energies into grids and independent power systems.
			Electric Drive System	Introduction to electrical drive systems, fundamental theory of mechanical motion, power electronics converters for electrical drives, DC drive system and its control, synchronous drive system and its control, induction drive system and its control, switched reluctance system and its control.
	Thr	High Voltage Engineering		Generation of high AC, DC and impulse voltage, High voltage measurements in Particular voltage transformers and dividers. Quality assurance and accreditation of testing laboratories. Electric field calculation. Gas discharges. Liquid and solid dielectrics. Traveling Waves and Overvoltage. Insulation coordination. High voltage switchgear. Electromagnetic compatibility (EMC).
	Fri	Electrical Power Systems		System and structure of the electrical energy supply. fundamental principles of power economics. investment and cost calculation. economic power generation. fundamental principles of system, analysis. symmetrical components. generators. small signal stability in interconnected power systems. transformers. steady-state behaviors of lines. Inductance and capacitance calculation of single and multiple-circuit lines. inductive. capacitive and galvanic coupling. load frequency control, power and frequency oscillation. frequency-dependent load shedding. load flow calculation. short circuit calculation.

Semester1	CE	AM	PM	Course Descriptions
Aug-Dec	Mon	Advanced Mathematics in Electrical Engineering		see SSE
	Tue	Communication Protocols		The ISO/OSI reference model. Local area network. Basic concepts and design aspect of communication protocols.TCP/IP protocol suit. Error handling methods. Routing algorithms. TCP congestion control. Smart grid communication network architecture – WAN, FAN. Network design consideration. DLMS/COSEM and ANSI C Protocols. Wide area monitoring system. Application in utility operation–SCADA and WAMS.
			Mobile Radio Systems	Introduction to Wireless Communications. Probability Theory. Random Variables. Random Processes. Matrix definitions. Operations. and Properties. Path Loss. Shadowing. Statistical Multipath Channel Models. Digital Modulation and Detection. Performance of Digital Modulation over Wireless Channels. Multiple Access Techniques. Signal to Noise Power Ratio. Detection Error Probability.
	Thr	Electromagnetic Field Theory		Maxwell's equations, Time-dependent fields: planewave propagation; characteristics and power flow. Solution of boundary-value problems for time-harmonic fields, Relation between field theory and circuit theory: lump elements and transmission lines.
	Fri	Antenna Engineering		Antenna types and parameters. Antenna analysis: wire antennas; Aperture antennas; Reflectors, Microstrip antennas and broadband antennas, Concept of antenna arrays, Antenna systems and measurement techniques.

Semester1	SGE	AM	PM	Course Descriptions
Aug-Dec	Mon	Advanced Mathematics in Electrical Engineering		To be confirmed, SGE may start in 2019 See SSE
	Tue	Advanced Metering Infrastructure		Smart Meters, Automatic Meter Reading (AMR). Communications Network Architecture for Smart Grids. Meter Data Acquisition System. Meter Data Management System (MDMS). Anti-tampering Methodology. Phasor Measurement Unit (PMU). Smart Grid System Integration.
			Renewable Energies and Electric Vehicle	Introduction of renewable energies for electrical power generation, renewable energy sources for conversion to electrical power such as photovoltaic, wind turbines, hydro power and solar thermal power plants, biomass, geothermal and ocean energy, energy storage technologies for system integration, introduction of electric vehicle technology, electric drives and control, battery storage system for electric vehicles.
	Thr	Communication Protocols for Smart Grids		The ISO/OSI reference model. Local area network. Basic concepts and design aspect of communication protocols.TCP/IP protocol suit. Error handling methods. Routing algorithms. TCP congestion control. Smart grid communication network architecture – WAN, FAN. Network design consideration. DLMS/COSEM and ANSI C Protocols. Wide area monitoring system. Application in utility operation–SCADA and WAMS.
	Fri		Modern Power Grids Analytics and Operations	Traditional power grid analytics and operations,economic operation of power grids, active power and frequency control. reactive power and voltage control,static and dynamic security assessments. integration of large-scale renewable energy and distributed generation resources. paradigm shift in power grid analytics and operationsin the age of smart grids. modern energy control center (SCADA, WAMS, EMS, DMS). advanced decision support tools in power grid operations.

TGGS Electrical and Softwaresystems Engineering Course Descriptions and Schedule for Semester 2 January-May

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Semester2	SSE	AM	PM	Course Descriptions
Jan-May	Mon	Industry Research Methodology		Research methodology for industrial application. Technical writing and presentation. Literature reviews. Technical seminar.
			Embedded Software	Components and the operation of microcontrollers, components and the operation of PLC, programming language and functions for PLC. examples of embedded software applications.
	Tue	Efficient Algorithms		Design and analysis of algorithms, asymptotic notation, data structures, binary search tree, red-black tree, divide and conquer. heap sort. quick sort, lower bound for sorting. dynamic programming. shortest path, greedy algorithm, minimum spanning tree. maximum flow. string matching, applications in computer science.
			Advanced Digital Image Processing	Advanced digital image processing, image compression such as JPEG and JPEG 2000, image copyright protection, image encryption, Learning by implementing and investigating image processing algorithms in Matlab, Research and development of new image processing projects.
	Fri	Machine Learning (Selected Topics in Software Systems Engineering)		Advanced topics in software systems relevant to software systems engineering. Machine learning: This course introduces machine learning techniques. Topics include: supervised learning, unsupervised learning, and best practices in machine learning. The course draws case studies and applications, e.g. smart robots, text understanding, computer vision, database mining, and other areas.

Semester2	EPE	AM	PM	Course Descriptions
Jan-May	Mon	Industry Research Methodology		see SSE
	Tue	Battery Storage Systems		Fundamentals of battery, basics of electrochemistry, primary battery, secondary battery, battery management system, battery model, application of battery.
	Thr	Electrical Transients in Electrical Power Systems		Fundamental of electrical transients, Switching transients, Damping of transient oscillation, Abnormal switching transients, Transients in three-phase circuits, Transients on transmission lines, Behavior of equipment under transient conditions, Lightning, Protection of systems and equipment against transient over voltages.
			Distributed Generation Systems	Introduction to distributed generation (DG), Technologies of DG: conventional and renewable technologies, Grid interconnection, Active distribution networks, Technical impacts of distributed generation on distribution systems: loss, voltage profile, reliability, protection, power flow, Smart grids with DG, Economics aspects.
	Fri	Power System Reliability		Basic probability theory and reliability concepts; Generating capacity reliability evaluation; Operating reserve assessment; Composite system reliability evaluation; Substation reliability evaluation; Distribution system reliability assessment; Reliability worth assessment

Semester2	CE	AM	PM	Course Descriptions
Jan-May	Mon	Industry Research Methodology		see SSE
	Tue	Mobile Radio Networks		Introduction of mobile radio networks. The spread spectrum systems and their usage in CDMA-based networks. The WCDMA/UMTS networks including its architecture, the used entities, and the system design choices and principles behind. Comparisons to 2G cellular networks. Introduction to 4G network. WLANs based on the IEEE 802.11 standard. Basic aspects of the physical layer as well as the medium access and issues of whole networks. The basic foundations of wireless MAC designs. Introduction to Bluetooth (802.15.1) and ZigBee (802.15.4) as the short range communications. Wireless Sensor Network: applications and network management.
			Broadband Wireless Communication Systems	Introduction to digital communications, discrete channel models, principles of orthogonal frequency division multiplexing (OFDM), Fourier representation. multicarrier transmission, implementation by fast Fourier transform (FFT). cyclic prefix, timing and frequency offset, timing and frequency synchronization. channel estimation, probability of error analysis, OFDM systems examples, principles of code division multiple access (CDMA), CDMA transmission channel models, receiver structures for synchronous and asynchronous transmissions, multicarrier.
	Thr	Software-Defined Radio and Cognitive Radio Network		Spectrum usage and regulation. Software-defined radios. Spectrum sensing. Cognitive radio network and architectures. Dynamic spectrum access technologies and algorithms. Cognitive radio protocol architectures. Cognitive networking. Standard for cognitive radios. Cognitive radio network security.
	Fri	Microwave Components and Cricuit Design		Electromagnetic field theory, Network theory generalization, S-parameters. Signal flow graph. Smith chart. Design of planar circuits, Filters, dividers. Couplers. Matching networks. Microwave electronic devices including diodes; BJTs; MESFETs and HEMTs. Low noise amplifier design. Power amplifier design. Transmitter design. Receiver design.

Semester2	SGE	AM	PM	Course Descriptions
Jan-May	Mon	Industry Research Methodology		To be confirmed, SGE may start in 2019 see SSE
	Tue	Cyber Security for Smart Grids		Security architecture, Security services, System security, Network security, Cyber security, Protocol failure analysis, Cyber attacks, Introduction to cryptography, Encryption, Data integrity, Authentication, Wireless network security, Security of RF mesh, Wi-Fi systems, Security of cellular networks, Security of PLC, Security of
	Thr	Internet of Things		Components and architecture of IoT, Embedded system, Embedded software, Communication interfaces for embedded systems, Machine to machine communication, IoT applications and case studies, Design and development of IoT application.
			Asset Management and Substation Automation	Introduction to high voltage equipment and substation, Aging and degradation of high voltage equipment, Maintenance strategies applied to high voltage equipment, Inspection and maintenance of power transformer, Inspection and maintenance of power circuit breaker, Useful lifetime assessment of high voltage equipment, Preventive and condition-based maintenance of high voltage equipment, Condition assessment of high voltage equipment, Risk management of utilization and maintenance of high voltage equipment, Inventory control of spare part, Economic analysis of high voltage equipment utilization.
			Communication Systems for Smart Grids	Hardware components for wireless communications in smart grids, Reflection and transmission, RF cables and transmission line theory in communications systems, RF passive and active components, Antenna basics, Maintenance of RF and microwave systems and basic measurement techniques, Principles of wireless power transfer, RF mesh networks, Power Line Communications (PLC), Cellular Networks.
	Fri	Power System Data Management and Analyse		Data managements and Analyses for power system application. Relational Models and Database using SQL. Semi-Structured Models and Database using XML, Concepts for Performance Tuning and Safety. Data warehouse, Data mining, Big Data Analysis. Data Visualization. Computation and Data Analyses.