fundamentals of Smart Grids to renewable energy systems, energy storage, IT communications and standards. The course focuses mainly on intelligent electricity distribution networks and provides the basis

Indicative Lecture Schedule

Period	

Course Details

Credits

This is a 6 UoC course and the expected workload is **8 - 10 hours** per week throughout the 10 week Term.

Relationship to Other Courses

This is a postgraduate course in the School of Electrical Engineering and Telecommunications offered through the Graduate School of Engineering.

Pre-requisites and Assumed Knowledge

There are no pre-requisites courses for attending GSOE9141.

Learning outcomes

After successful completion of this course, you should be able to:

1. LO1: Identify the key elements of Smart Grids and visualise the roadmap towards next-Gen electricity networks.
2. LO2: Evaluate technology options pertaining to renewable energy generation, energy storage, data handling and communications for Smart Grids.
3. LO3: Justify technological and economical choices in the context of existing commercial Smart Grids projects and suggest improvements and expansions.
4. LO4: Determine the relevance of Smart Grids projects, develop ways to evaluate their impacts and implications
5. LO5: Analyse the new roles of utilities and consumers in Smart Grids and pinpoint business and market opportunities and potential gains.

This course is designed to provide the above learning outcomes which arise from targeted graduate capabilities listed in Appendix A. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (listed in Appendix B). This course also addresses the Engineers Australia (National Accreditation Body) Stage I competency standard as outlined in Appendix C.

Syllabus

Smart grids; Intelligent Distribution Networks; Renewable Energy; Distributed Generation; DG Integration; Solar; Wind; Energy Storage Technologies; Chemical, Mechanical and Electrical Energy Storage; Demand Side Management; Load Management; Demand Side Response; Conservation Voltage Reduction; Demand Pricing; Time of Use; Real Time Pricing; Peak Time Pricing; FDIR; Reactive Power Optimisation; Volt-Var Optimisation; Distribution Automation; Advanced Asset Management; Electric Vehicles; Smart Meters; Advanced Measuring Infrastructure; Distribution Management Systems; Smart Grid ICT; Common Information Model; Cyber-Security; Wide Area Measurement Systems; Smart Grid Communications; SCADA; SG costs; Markets; Ancillary Markets; Smart Grid Standards; Substation Automation; Stakeholders and Benefits;

Teaching Strategies

Delivery Mode

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using a combination of:

Weekly Seminars
Course material provided through Moodle
Supplementary video resources
Relevant Assessment Tasks

You are expected to attend all lectures of the course. The facilitator will discuss assessment and assignment criteria and comment on current assessment tasks and marks during these six sessions.

The material of the course will be provided on-line through UNSW's Moodle page. The students are expected to follow the material of the course as it is weekly updated on the website but they are free to study on their own pace.

Additional video resources will be also linked. These resources have been selected as they provide valuable insights from industrial meetings and forums, enhance the coverage of the material and should be considered as content of the course. You can view these resources at your own pace, and you will be required to comment and express your opinions and ideas during lectures.

The rationale behind these methods of delivery for the course is that the Smart Grid is a complex collection of different technologies and the course offers a "bird's eye" view of the core components. The course is not designed to be a power system analysis or telecommunication course but provides the students with the knowledge and the resources in order to identify and tackle the requirements in the current transformation of the electricity networks.

Learning in this Course

Well done for reading so far in this course outline. The first two students to e-mail me and mention this section of the course, will get two and one bonus marks in their final course mark. You are expected to attend all lectures, tutorials, labs, and mid-term exams in order to maximise learning. You must prepare well for your laboratory classes and your lab work will be assessed. In addition to the lecture notes/video, you should read relevant sections of the recommended text. Reading additional texts will further enhance your learning experience. Group learning is also encouraged. UNSW assumes that self-directed study of this kind is undertaken in addition to attending face-to-face classes throughout the course.

Assessment

The assessment scheme in this course reflects the intention to assess your learning progress through the term. Ongoing assessment occurs through bi-weekly learning journal submissions and early assessment submission requirements.

Final Exam

The course does not have a final exam.

Assignments

The course does not include a final exam and all assessment (formative and summative) will take place throughout the term. The assessment tasks include:

ASMT1: 3 reports which include brief literature reviews or research related to the topics discussed in the course. Bi-weekly reports (learning Journals) (3 x 10 marks = 30 marks)
ASMT2: Multiple choice test (1 x 15 marks = 15 marks)
ASMT3: A literature review of a topic of your choice relevant to Smart Grids. A list of suggested topics will be made available in Week 2 (Presentation 10 marks - Final Report 20 marks).
ASMT4: A comprehensive report on the economic assessment and impact of the Smart Grid-Smart City project based on the modeling available by AusGrid. (25 marks)

Submission of Assessment Tasks

Assessment tasks will be submitted via the Moodle page of the course. Each assessment task will have two deadlines, a soft deadline for the submission of each assignment after which submissions will incur a 10% penalty per day of delayed submission. The soft deadline will be followed by a hard deadline three days later, after which no marks will be given to an assignment. Submission of an assignment past the hard deadline will be accepted via email.

Marking of the assessments will be based on a detailed rubric that will be made available in Moodle during the first week of the term and explained in detail at the first face-to-face session of the course.

Relationship of Assessment Methods to Learning Outcomes

	Learning Outcomes				
Assessment	**1**	**2**	**3**	**4**	**5**
ASMT 1	X	X	X	X	X
ASMT 2	X	X			
ASMT 3	X	X	X	X	X
ASMT 4	X	X	X	X	X

Course Resources

Textbooks

Prescribed textbook

No textbook is prescribed for the course and the presentations – notes include material from a wide range of sources that cover the different aspects of the Smart Grid. References to related books and supplementary reading and video material) will be provided when deemed necessary.

However, in T2, 2020 we will be using additional resources based on Chapters of the following textbook:

Bernd M. Buchholz & Zbigniew A. Styczynski " Smart Grids Fundamentals and Technologies in Electric Power Systems of the future" Springer-Verlag GmbH Germany, part of Springer Nature 2020

which is available through the UNSW library and will also be shared through Moodle. Additional major references of the subject include the

IEEE Transactions on Smart Grid
IEEE Innovative Smart Grid Technologies Conference (ISGT) family of conferences

Additional References

Links to supplementary resources and material will be given each week at the course's Moodle website. Some references related to the subject are the following:

CW Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.
J Ekanayake, K. Liyanage, J.Wu, A. Yokoyama, N. Jenkins, "Smart Grid: Technology and Applications"-

Other Matters

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see:
http://www.lc.unsw.edu.au/plagiarism.

policies:
http://www.engineering.unsw.edu.au/electrical-engineering/policies-and-procedures
https://my.unsw.edu.au/student/atoz/ABC.html

Appendices

Appendix A: Targeted Graduate Capabilities

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities which were developed by the school in conjunction with the requirements of professional and industry bodies:

The ability to apply knowledge of basic science and fundamental technologies;

Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

	Program Intended Learning Outcomes	
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	X
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	
	PE1.3 In-depth understanding of specialist bodies of knowledge	X
	PE1.4 Discernment of knowledge development and research directions	X
	PE1.5 Knowledge of engineering design practice	
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	X
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving	X
	PE2.2 Fluent application of engineering techniques, tools and resources	X
	PE2.3 Application of systematic engineering synthesis and design processes	X
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability	X