COURSE OUTLINE

ELC203 Power Systems

Course Coordinator: Sajeeb Saha (ssaha@usc.edu.au) **School:** School of Science, Technology and Engineering

2021 | Semester 2

USC Moreton Bay	ON CAMPUS	Most of your course is on campus but you may be able to do some components of this course online.

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

Modern power engineering is concerned with the generation, transmission, and distribution of electrical power within a large interconnected network. You will learn the principles of classical and modern power systems and develop an understanding of the theory and modelling of component behaviour under steady-state and transient conditions. You will also explore the challenges faced by the electricity industry from distributed generation and storage of electricity by PV cells. You will also learn how to use sophisticated software tools to design and evaluate the performance of power systems.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
ON CAMPUS			
Tutorial/Workshop 1	2hrs	Not applicable	5 times
Tutorial/Workshop 1 – 5 weeks hardware and 5 weeks software	2hrs	Not applicable	5 times
Lecture	2hrs	Week 1	13 times

1.3. Course Topics

- Magnetic circuit theory
- Synchronous machines
- Induction and PM machines
- Generator and Transformer Models
- Power generation
- Load flow and load flow analysis
- Power system stability
- Distribution network
- Renewable energy systems

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...	GRADUATE QUALITIES MAPPING Completing these tasks successfully will contribute to you becoming...	PROFESSIONAL STANDARD MAPPING Engineers Australia
1 Investigate the essential components of steady state power systems through the application of theories and modelling.	Creative and critical thinker	1.1 - Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. 1.2 - Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
2 Solve load-flow problems of large power systems with appropriate models of transmission lines, transformers, generators and loads.	Empowered	1.3 - In-depth understanding of specialist bodies of knowledge within the engineering discipline.
3 Demonstrate knowledge and apply theories in power distribution networks, system stability, energy storage and voltage regulation in the system.	Knowledgeable	1.5 - Knowledge of engineering design practice and contextual factors impacting the engineering discipline.
4 Communicate using appropriate engineering terminology, symbols and diagrams.	Engaged	3.2 - Effective oral and written communication in professional and lay domains. 3.4 - Professional use and management of information.
5 Develop power system structures and appreciate the role of the main elements.	Empowered	2.3 - Application of systematic engineering synthesis and design processes.
6 Work collaboratively in teams to design control system to meet specified requirements.	Empowered	3.6 - Effective team membership and team leadership.

5. Am I eligible to enrol in this course?

Refer to the USC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

ELC202 and must be enrolled in Program SC404, SC405, SC410, SC411, SC425 or AB101

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

Not applicable

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

Performance and feedback from the workshop tasks will demonstrate the level of proficiency and understanding of the course material.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Portfolio	Group	30%	Each task is to be documented in a report and submitted in a group (maximum page limit of 15 pages)	Refer to Format	In Class
All	2	Artefact - Technical and Scientific, and Written Piece	Individual	30%	The project-based design / case Study report is to be written with a maximum page limit of 10 pages.	Week 13	Online Assignment Submission
All	3	Examination - Centrally Scheduled	Individual	40%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Reports -workshop and site visit

GOAL:	You'll develop your practical problem-solving skills through experiments using hardware and computer simulation on machine characteristics and power system design. You'll design and operate simple power system equipment and networks, analyse data obtained from the experiments, compare and use industrial practices, and document your scientific conclusions in a report. Site visit will allow you to work in a group to characterise a specific component of a power system in a large network.
PRODUCT:	Portfolio
FORMAT:	Maximum of 15 pages including diagrams and calculations.

CRITERIA:

No.		Learning Outcome assessed
1	Investigation of the essential components of steady state power systems through the application of theories and modelling	1 5
2	Demonstration of knowledge and application of theories in power distribution networks, system stability, energy storage and voltage regulation in the system	2 3
3	Communication using appropriate engineering terminology, symbols and diagrams	4
4	Demonstrated ability to work collaboratively in teams to design control system to meet specified requirements	6

All - Assessment Task 2: Project-based Design / Case Study

GOAL:	This task will develop your skills in critical thinking and the evaluation of engineering systems, and formulate and apply appropriate analytical principles to describe, design and utilize the appropriate industry Standard or grid code.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
FORMAT:	1500 words equivalent including diagrams and calculations.

CRITERIA:

No.		Learning Outcome assessed
1	Solution of load-flow problems of large power systems with essential components.	2
2	Demonstration of knowledge and application of theories in power distribution networks, system stability, energy storage and voltage regulation in the system	3
3	Communication using appropriate engineering terminology, symbols and diagrams	4
4	Development of power system structures and appreciate the role of the main elements	5
5	Critical analysis and evaluation of project or case study	6

All - Assessment Task 3: Final Exam

GOAL:	The final exam will develop your ability to independently apply your skills and knowledge to solve familiar problem-based questions with confidence within a set time limit and without access to additional resources.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	Centrally-scheduled exam.

CRITERIA:

No.		Learning Outcome assessed
1	Investigation of the essential components of steady state power systems through the application of theories and modelling	1
2	Correct solutions to load-flow problems of large power systems with essential components.	2
3	Demonstration of knowledge and application of theories in power distribution networks, system stability, energy storage and voltage regulation in the system	3
4	Communication using appropriate engineering terminology, symbols and diagrams	4

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

> There are no required/recommended resources for this course.

8.2. Specific requirements

Fully enclosed shoes must be worn in the engineering laboratory. If you do not have the correct shoes you will not be allowed to do the practical. You must also undertake the laboratory induction before you can undertake any practical.

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training for students, and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%
The course is graded using the Standard Grading scale
You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate:
- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the Learning Advisers web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.5. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to Student Hub, email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.6. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, , injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, AccessAbility Services can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to Student Hub, email AccessAbility@usc.edu.au or call 07 5430 2890.

10.7. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website: http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.8. General Enquiries

In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **USC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au