

## COURSE OUTLINE

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### ECE 410 – Power Electronics

Term –SUMMER 2020 (202005)

#### Instructor

Dr. Ashoka K.S. Bhat  
Phone: 250-721-8682  
E-mail: [abhat@enr.uvic.ca](mailto:abhat@enr.uvic.ca)

#### Office Hours

Days: Tuesday  
Time: 2:30 to 3:30 PM  
Location/Platform/link: Blackboard Collaborate

#### Course Objectives

- To introduce students to the basic principles of solid state power conversion and power semiconductor circuits.

#### Learning Outcomes

- You will learn (summary):
- The basic operation of power devices SCR, MOSFET and IGBT; their basic characteristics and limitations; and their use in power converters together with losses and heat sink calculations.
- Basic operating principles of controlled rectifiers, ac-to-ac and dc-to-dc converters, and dc-to-ac inverters, and how to analyze these converters and some application examples.

#### Syllabus (Approximate number of lectures)

Introduction (1 lecture): Power electronics and its scope  
Circuits with Switches and Diodes (4 lectures)  
Power Semiconductor Switches (5 lectures)  
Controlled Half-wave Rectifier (1.5 lectures)  
AC Voltage Controllers (4 lectures)  
Full-Wave Controlled Rectifiers and Power Factor Correction (5.5 lectures)  
DC-to-DC Converters - 1 (Choppers) (4.5 lectures)  
Switching Regulators (DC-to-DC Converters – 2) (4 lectures)  
Inverters (5.5 lectures)  
Current Source Inverters (1 lecture)  
Application Examples (1 lecture)

A-Section(s): A01 / CRN 30316

Days: Tuesday, Wednesday, Friday

Time: 11:30 – 12:20

Location/Platform/link: Blackboard Collaborate

Marker: Karthigat Thangavelu ([karthigat@uvic.ca](mailto:karthigat@uvic.ca))

All labs will be video-taped assisted by TA: Praneydeep Rastogi ([praney.deep.rastogi@gmail.com](mailto:praney.deep.rastogi@gmail.com))

Lab TAs: Shahin Honari E-mail: [shahinhonari@uvic.ca](mailto:shahinhonari@uvic.ca), Elham Hosseini Toodeshki ([e.hosseini88@gmail.com](mailto:e.hosseini88@gmail.com)) and Bahareh Torabidavan ([bambtorabi@gmail.com](mailto:bambtorabi@gmail.com)).

Marking of reports and any other related duties will be distributed between these TAs.

## Required Text

1. A.K.S. Bhat, ECE410 Course Notes, 2020: <http://www.ece.uvic.ca/~bhat>  
(will be available on the web during the semester).
2. A.K.S. Bhat, "Laboratory Manual for ECE410 - Power Electronics", University of Victoria, 2018.

## Optional Text

Title: Power Electronics                      Author: Issa Batarseh and Ahmad Harb  
Publisher: Springer                              Year: 2018

Earlier edition of this book is also OK (details):

Title: Power Electronic Circuits                      Author: Issa Batarseh  
Publisher: John Wiley and Sons                      Year: 2004

## References:

1. S.B. Dewan and A. Straughen, "Power semiconductor circuits", John Wiley, 1975.
2. M.H. Rashid, "Power Electronics - Circuits, Devices, and Applications", Fourth Edition, Prentice-Hall, 2013.
3. N. Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics - Converters, Applications, and Design", John Wiley and Sons, 2003.

## Online Course Delivery:

As this course will be conducted online during this term, students will need to complete assignments/labs online. The students will require access to a computer which has the following software installed: Adobe Acrobat Reader.

## Assessment:

Assignments	5%	Due Dates: Will be announced as the course progresses (4 to 5 assignments)
Labs	25%	
Mid-term	20%	Date: June 23 (will be finalized during first week of lectures)
Final Exam	50%	
Total	100%	

## **Important: All deadlines and schedules for this course will reference Pacific Daylight Time.**

**Note:** Failure to complete all laboratory requirements will result in a grade of N being awarded for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

<https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/S1AAgoGuV?bc=true&bcCurrent=14%20-%20Grading&bclItem=policies>

Assignment of an E grade and supplemental examination for this course will be at the discretion of the Course Instructor. The rules for supplemental examinations can be found in the current Undergraduate Calendar.

[https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/SJ2Rxoz\\_N?bc=true&bcCurrent=13%20-%20Examinations&bclItem=policies](https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/SJ2Rxoz_N?bc=true&bcCurrent=13%20-%20Examinations&bclItem=policies)

**Note to students:** Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by

email or the Chair's Assistant to set up an appointment.

**Course Withdrawal Deadlines:**

- May 16, 2020: Withdrawal with 100% reduction of tuition fees
- June 6, 2020: Withdrawal with 50% reduction of tuition fees
- July 1, 2020: Last day for withdrawal (no fees returned)

**Accommodation of Religious Observance:**

<https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/r1q0gofdN?bc=true&bcCurrent=10%20-%20Accommodation%20of%20Religious%20Observance&bcltemType=policies>

**Policy on Inclusivity and Diversity:**

Engineering: <https://www.uvic.ca/engineering/about/equity/index.php>

Academic Calendar: <https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/HkQ0pzdAN>

**Standards of Professional Behaviour:**

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

<https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

**Academic Integrity**

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity.

[https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/Sk\\_0xsM\\_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcltemType=policies](https://www.uvic.ca/calendar2020-05/undergrad/index.php#/policy/Sk_0xsM_V?bc=true&bcCurrent=08%20-%20Policy%20on%20Academic%20Integrity&bcltemType=policies)

**Equality:**

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum, and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging an appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building. <https://www.uvic.ca/services/cal/>. The University of Victoria is committed to promoting, providing, and protecting a positive, supportive, and safe learning and working environment for all its members.

**Course Lecture Notes:**

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

**Sexualized Violence Prevention and Response at Uvic:**

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting [www.uvic.ca/svp](http://www.uvic.ca/svp). If you or someone you know has been impacted by sexualized violence and needs information, advice,

and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

**Where:** Sexualized violence resource office in EQHR; Sedgewick C119

**Phone:** 250.721.8021

**Email:** [svpcoordinator@uvic.ca](mailto:svpcoordinator@uvic.ca)

**Web:** [www.uvic.ca/svp](http://www.uvic.ca/svp)

**Office of the Ombudsperson:**

The [Office of the Ombudsperson](#) is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations. Phone: 250-721-8357; Email: [ombuddy@uvic.ca](mailto:ombuddy@uvic.ca); Web: <https://uvicombudsperson.ca/>