


3.4.7: E-content is developed by teachers

Contents

1] Contents developed by the teachers of University

Course Syllabus

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| Unit | Topics |
|------|--|
| 1 | <p>Power Semiconductor Switches:</p> <p>Desired Characteristics in Controllable Switches, Comparison of Controllable Switches, Pow MOSFET – Structure, Characteristics, Operation, Switching characteristics, Operation Limita and Safe Operating Area, IGBT – Structure, Characteristics, Latchup in IGBT, Operation, Sw characteristics, Operation Limitation and Safe Operating Area, Comparison of Power MOSFI IGBT, SiC MOSFET</p> |
| 2 | <p>Gate Drive Circuit and Snubbers:</p> <p>Electrically Isolated Drive Circuits - Optocoupler Isolated Drive Circuits, Transformer-Isolated Circuits, Blanking Times for Bridge Circuits</p> <p>Function of Snubbers, Need for snubber in transistor circuits, Diode Snubbers, Capacitive Snubbers, Turn OFF snubber, Overvoltage Snubber, Turn On Snubber</p> |
| 3 | <p>AC/DC Rectifiers:</p> <p>Operation of Single-Phase Uncontrolled Rectifier, Single Phase Fully Controlled Rectifiers, T Phase Uncontrolled Rectifier, Three Phase Fully Controlled Rectifier with RL and RLE load. Performance Parameters of controlled converters – Input Displacement Factor, Distortion Fa Power Factor and Total Harmonic Distortion</p> <p>Power Factor Improvement Techniques, Multipulse Converters</p> |
| 4 | <p>Pulse Width Modulated Inverters:</p> <p>Concept of Switched Mode Inverters, Pulse-Width-Modulated Switching Scheme, Square-Wi Switching Scheme, PWM Of Single-Phase Inverters, PWM of Three Phase Inverter, Effect of Blanking Time on Voltage in PWM Inverters</p> <p>Matrix Converter – Principle, Operation and Modulation Schemes of Matrix Converter</p> |
| 6 | <p>Switched Mode Power Supply</p> <p>Step-Down (Buck) Converter, Step-up (Boost) Converter, Buck-Boost Converter, Cuk dc-dc Converter, Full Bridge dc-dc Converter, Isolated Converters - Forward Converter, Flyback Converter</p> |









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|---|---|
| 7 | <p>Modelling and Control of Power Electronic Converters</p> <p>Types of models – Switched model, average model, large signal and small signal model, Sw model of power electronic converter, Classical average model of converter, generalized average model, Control Principles of Power Electronic Converters, Linear Control Approaches for Power Converters – A case study</p> |
| | Total Hours |

Course Summary:

| Date | Details | Due |
|------------------|---|----------------|
| Sat Oct 30, 2021 |  <u>Week-1&2</u> https://canvas.instructure.com/courses/3699795/assignments/25850022 | due by 11:59pm |
| Sat Nov 20, 2021 |  <u>Experiment-1</u> https://canvas.instructure.com/courses/3699795/assignments/25864024 | due by 11:59pm |
| |  <u>Experiment-2</u> https://canvas.instructure.com/courses/3699795/assignments/25864048 | due by 11:59pm |
| Sat Nov 27, 2021 |  <u>Week-3-5</u> https://canvas.instructure.com/courses/3699795/assignments/25864117 | due by 11:59pm |
| |  <u>Week-6-8</u> https://canvas.instructure.com/courses/3699795/assignments/26702150 | due by 11:59pm |
| Sat Dec 18, 2021 |  <u>Experiment-3</u> https://canvas.instructure.com/courses/3699795/assignments/26702201 | due by 11:59pm |
| Wed Dec 22, 2021 |  <u>Experiment-4</u> https://canvas.instructure.com/courses/3699795/assignments/26702223 | due by 11:59pm |
| |  <u>Experiment-5</u> https://canvas.instructure.com/courses/3699795/assignments/26702245 | due by 11:59pm |
| Fri Dec 31, 2021 |  <u>Experiment-6</u> https://canvas.instructure.com/courses/3699795/assignments/26702250 | due by 11:59pm |
| |  <u>Presentation</u> https://canvas.instructure.com/courses/3699795/assignments/25865357 | due by 11:59pm |



| Date | Details | Due |
|------------------|--|----------------|
| Sat Jan 8, 2022 |  Experiment-7 Experiment-7 | due by 11:59pm |
| |  Experiment-8 Experiment-8 | due by 11:59pm |
| |  Experiment-9 Experiment-9 | due by 11:59pm |
| Sat Jan 15, 2022 |  Week-9-12 Week-9-12 | due by 11:59pm |
| |  Design Experiment Design Experiment | due by 11:59pm |
| Sat Jan 22, 2022 |  Final Report Final Report | due by 11:59pm |



Collapse All

View Progress

+ Module



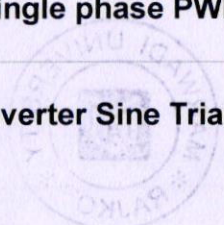
| | |
|---|-------|
| ☰ ▼ Power Semiconductor Switches | ✓ + ☰ |
| ☰ 🔗 Introduction to Power Electronics - Overview | ✓ ☰ |
| ☰ 🔗 Power Electronics in EV | ✓ ☰ |
| ☰ 🔗 How does an Electric Car work ? - Role of Power Electronics | ✓ ☰ |
| ☰ 🔗 Characteristics of Controllable switches | ✓ ☰ |
| ☰ 🔗 Power Semiconductor Devices - overview | ✓ ☰ |
| ☰ 🔗 Power Devices: BJT, MOSFET and IGBT | ✓ ☰ |
| ☰ 🔗 Introduction to IGBT | ✓ ☰ |
| ☰ 🔗 Power Semiconductor Devices - MOSFET & IGBT | ✓ ☰ |
| ☰ 🔗 Wide bandgap Devices used in Power Electronics | ✓ ☰ |
| ☰ 🔗 SiC Power Devices | ✓ ☰ |
| ☰ ▼ Gate Drive Circuit and Snubbers | ✓ + ☰ |
| ☰ 🔗 Transformer and Opto Isolation | ✓ ☰ |
| ☰ 🔗 MOSFET drive circuit | ✓ ☰ |
| ☰ 🔗 Overcurrent Protection of Switches | ✓ ☰ |
| ☰ 🔗 Turn ON and Turn OFF snubber | ✓ ☰ |



- ☰ 🔗 Gate drive - practical points ✔️ ⋮
- ☰ 🔗 PCB layout guidelines to optimize power supply performance ✔️ ⋮






- ☰ ▼ AC/DC Rectifiers ✔️ + ⋮
- ☰ 🔗 Single Phase Controlled Rectifier ✔️ ⋮
- ☰ 🔗 Three Phase controlled converter-1 ✔️ ⋮
- ☰ 🔗 Three Phase controlled converter-2 ✔️ ⋮
- ☰ 🔗 Three Phase controlled converter-3 ✔️ ⋮
- ☰ 🔗 Three Phase controlled converter-4 ✔️ ⋮
- ☰ 🔗 Power Factor Improvement Techniques ✔️ ⋮
- ☰ 🔗 Sine Triangle PWM Control of Converter ✔️ ⋮
- ☰ 🔗 Front-end Ac-Dc Converter with harmonic control ✔️ ⋮
- ☰ 🔗 Front-End Ac to Dc Converter - Simulation study ✔️ ⋮









- ☰ ▼ Pulse Width Modulated Inverters ✔️ + ⋮
- ☰ 🔗 Basics of DC to AC Converter 1 ✔️ ⋮
- ☰ 🔗 Basics of DC to AC Converter 2 ✔️ ⋮
- ☰ 🔗 Single phase PWM for single phase inverter ✔️ ⋮
- ☰ 🔗 Inverter Sine Triangle PWM ✔️ ⋮




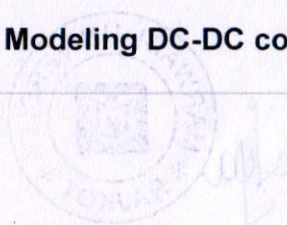
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|---|---|---|---|
| ☰ |  Inverter -Current Hysteresis Controlled PWM | ✓ | ⋮ |
| ☰ |  Basics of space vector PWM | ✓ | ⋮ |
| ☰ |  Space Vector PWM | ✓ | ⋮ |
| ☰ |  Space Vector PWM Part - 2 | ✓ | ⋮ |
| ☰ |  Space Vector PWM Signal Generation | ✓ | ⋮ |





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|---|---|---|---|---|
| ☰ | ▼ Switched Mode Power Supply | ✓ | + | ⋮ |
| ☰ |  Introduction to DC-DC converter | ✓ | | ⋮ |
| ☰ |  Controlled Switches | ✓ | | ⋮ |
| ☰ |  Basic DC-DC converter | ✓ | | ⋮ |
| ☰ |  Non-Isolated converter - I | ✓ | | ⋮ |
| ☰ |  Non-Isolated converter -- II | ✓ | | ⋮ |
| ☰ |  Isolated Converters - I | ✓ | | ⋮ |
| ☰ |  Isolated Converters -- II | ✓ | | ⋮ |
| ☰ |  Conduction Modes of converter | ✓ | | ⋮ |

| | | | | |
|---|---|---|---|---|
| ☰ | ▼ Modelling and Control of Power Electronic Converters | ✓ | + | ⋮ |
| ☰ |  Modeling DC-DC converters | ✓ | | ⋮ |



Signature



| | | | | |
|---|---|--------------------------------------|---|---|
| ⋮ |  | State space representation - I | ✓ | ⋮ |
| ⋮ |  | State Space representation - II | ✓ | ⋮ |
| ⋮ |  | State Space Model of Boost Converter | ✓ | ⋮ |
| ⋮ |  | DC-DC converter controller | ✓ | ⋮ |

Spa.



Spa.

Search for Assignment

+ Group

+ Assignment (<https://canvas.instructure.com/courses/3699795/assignments/new>)

⋮ ▼ MU-IA

+ ⋮

Week-1&2



(<https://canvas.instructure.com/courses/3699795/assignments/25850022>)



Closed | Due Oct 30, 2021 at 11:59pm | 10 pts

Week-3-5



(<https://canvas.instructure.com/courses/3699795/assignments/25864117>)



Closed | Due Nov 27, 2021 at 11:59pm | 10 pts

Week-6-8



(<https://canvas.instructure.com/courses/3699795/assignments/26702150>)



Closed | Due Nov 27, 2021 at 11:59pm | 10 pts

Week-9-12



(<https://canvas.instructure.com/courses/3699795/assignments/27617974>)



Closed | Due Jan 15 at 11:59pm | 10 pts

⋮ ▼ MU - Continuous Interval Assessment (CSE)

+ ⋮

Presentation



(<https://canvas.instructure.com/courses/3699795/assignments/25865357>)



Closed | Due Dec 31, 2021 at 11:59pm | 20 pts

⋮ ▼ MU - Term Work

+ ⋮

Experiment-1



(<https://canvas.instructure.com/courses/3699795/assignments/25864024>)



Closed | Due Nov 20, 2021 at 11:59pm | 10 pts

Experiment-2












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Closed | Due Nov 20, 2021 at 11:59pm | 10 pts

Signature



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|---|---|---|---|---|
| ⋮ |  | Experiment-3 (https://canvas.instructure.com/courses/3699795/assignments/26702201) Closed Due Dec 18, 2021 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-4 (https://canvas.instructure.com/courses/3699795/assignments/26702223) Closed Due Dec 22, 2021 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-5 (https://canvas.instructure.com/courses/3699795/assignments/26702245) Closed Due Dec 31, 2021 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-6 (https://canvas.instructure.com/courses/3699795/assignments/26702250) Closed Due Dec 31, 2021 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-7 (https://canvas.instructure.com/courses/3699795/assignments/26702264) Closed Due Jan 8 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-8 (https://canvas.instructure.com/courses/3699795/assignments/26702279) Closed Due Jan 8 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Experiment-9 (https://canvas.instructure.com/courses/3699795/assignments/26702287) Closed Due Jan 15 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ |  | Design Experiment (https://canvas.instructure.com/courses/3699795/assignments/26702299) Closed Due Jan 22 at 11:59pm 10 pts | ✓ | ⋮ |
| ⋮ | ▼ | MU - End Semester Examination | + | ⋮ |
| ⋮ |  | Final Report (https://canvas.instructure.com/courses/3699795/assignments/25864159) Closed Due Jan 22 at 11:59pm 50 pts | ✓ | ⋮ |

Signature



List of Experiments

1. Obtain dynamic characteristics of IGBT under different loading conditions.
2. Design an opto-coupler based driver circuit for IGBT/MOSFET
3. Analyze the effect of snubber in the operation of IGBT based converter
4. Evaluate performance parameters of three phase converter with RL load.
5. Simulate a 12-pulse converter and compare the performance with 6-pulse converter.
6. Compare the performance of unipolar PWM and bipolar PWM scheme in single phase VSI.
7. Develop sine PWM scheme for Three Phase VSI.
8. Analyze the operation of Buck Converter under CCM and DCM.
9. Analyze the operation of Boost Converter under CCM and DCM.
10. Design an inductor/transformer for switch mode power supply.



Final Report

Published **Edit** ⋮

Students will develop a prototype of application with necessary simulation and prepare a report on it.

The report should contain following :

1. Title Page
2. Certificate
3. Abstract
4. Introduction
5. Theory of Operation
6. Simulation Results and Discussion
7. Experimental Results and Discussion
8. Conclusion
9. References

Sya.



Points 50
Submitting Nothing

| Due | For | Available from | Until |
|--------|----------|----------------------|------------------|
| Jan 22 | Everyone | Oct 20, 2021 at 12am | Feb 4 at 11:59pm |

+ [Rubric](#)



Gradebook ▾ View ▾ Actions ▾



Student Names

Assignment Names

Q Search Students ▾

Q Search Assignments ▾

| Student Name | Week-1&2 (https://canvas. Out of 10 | Week-3-5 (https://canvas Out of 10 | Week-6-8 (https://canvas Out of 10 | Week-9-12 (https://canv Out of 10 |
|---|--|---------------------------------------|---------------------------------------|--------------------------------------|
| Ahmedabdelrhman (https://ca... | 10 | 10 | 10 | 10 |
| Elisha Kodze Ngonidzashe... | 8 | 10 | 10 | 10 |
| DaShi Mung Doi (https://canv... | 6 | 5 | 5 | 5 |
| Mayur Jadav (https://canvas.in... | 5 | 8 | 8 | 5 |
| parth.prajapati115093@mar... | 5 | 5 | 5 | 5 |
| Siddharth Prajapati (https://c... | 8 | 9 | 8 | 5 |
| Punnum (https://canvas.instru... | - | - | - | - |
| Punnum (https://canvas.instru... | 5 | 5 | 5 | 5 |
| Nabarun Sarkar (https://canva... | 10 | - | - | - |
| Asefa Teganu (https://canvas.i... | 8 | 8 | 8 | 8 |
| Keyuri Varsakia (https://canva... | 8 | 5 | 5 | 5 |





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