

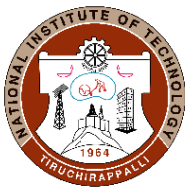
DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING

| COURSE PLAN – PART I | | | |
|---|---|--|--------------|
| Name of the programme and specialization | M.Tech. (Power Electronics) | | |
| Course Title | Power Converters | | |
| Course Code | EE 651 | No. of Credits | 3 |
| Course Code of Pre-requisite subject(s) | Power Electronics in UG | | |
| Session | July 2023 | Section (if, applicable) | A/B |
| Name of Faculty | N. Kumaresan | Department | EEE |
| Official Email | nkumar@nitt.edu | Telephone No. | 0431-2503257 |
| Name of Course Coordinator(s) (if, applicable) | | | |
| Official E-mail | | Telephone No. | |
| Course Type (please tick appropriately) | <input checked="" type="checkbox"/> Core course | <input type="checkbox"/> Elective course | |
| Syllabus (approved in BoS) | | | |
| <p>Analysis of power semiconductor switched circuits with R, L, RL, RC loads, d.c. motor load, battery charging circuit.</p> <p>Single-Phase and Three-Phase AC to DC converters-half controlled configurations- operating domains of three phase full converters and semi-converters – Reactive power considerations.</p> <p>Analysis and design of DC to DC converters- Control of DC-DC converters, Buck converters, Boost converters, Buck-Boost converters, Cuk converters</p> <p>Single phase and Three phase inverters, Voltage source and Current source inverters, Voltage control and harmonic minimization in inverters.</p> <p>AC to AC power conversion using voltage regulators, choppers and cyclo-converters, consideration of harmonics, introduction to Matrix converters.</p> <p>References Books:</p> <ol style="list-style-type: none"> 1. Ned Mohan, Undeland and Robbin, 'Power Electronics: converters, Application and design', John Wiley and sons. Inc, Newyork, 2006. 2. RashidM.H., 'PowerElectronics-Circuits, DevicesandApplications', PrenticeHall India, NewDelhi, 2009. 3.P.CSen., 'Modern Power Electronics', Wheeler publishing Company, 1st Edition, New Delhi, 2005. <p>Course Outcomes:</p> <p>Upon completion of the course, the students will be able to</p> <ol style="list-style-type: none"> 1. To study and analyze transient response of basic power electronic circuits. 2. To understand the working of commonly used power Converters. 3. To analyze and design various power converter systems. | | | |



| COURSE OBJECTIVES | | | |
|--|--|----------|----------|
| To give a systematic approach for transient and steady state analysis of all power electronic converters with passive and active loads | | | |
| MAPPING OF COs with POs | | | |
| Course Outcomes | Aligned Programme Outcomes (PO) | | |
| Upon completion of the course, the students will be able to | 1 | 2 | 3 |
| 1. study and analyze transient response of basic power electronic circuits | 3 | 2 | 3 |
| 2. understand the working of commonly used power Converters | 3 | 2 | 3 |
| 3. analyze and design various power converter systems | 3 | 2 | 3 |

| COURSE PLAN – PART II | | | |
|--|---|---|-------------------------|
| COURSE OVERVIEW | | | |
| <p>Power electronics can be considered as the technology associated with the conversion, control and conditioning of electric power from its available form to the desired electrical form, by the application of power semiconductor devices. Power Electronics is one of the fastest developing technologies today, having gone through dynamic changes in the last several decades.</p> <p>Application of Power Electronics ranges from power supplies to motion control, factory automation, transportation, energy storage, multi-megawatt industrial drives, power quality and electric power transmission / distribution. Further it is expected to evolve in several directions such as integrated systems for electronic power processing, intelligent control and energy management, distributed generation, automotive applications, electric traction, emerging applications in commercial / residential areas. Power Electronics will play a dominant role in the 21st century in industrial and utility applications with increased emphasis on energy saving and efficient control of industrial processes thereby helping to preserve the environment.</p> <p>Aim of this course is to give the exposure to the students on the analysis, operation and control of typical power converters, namely, dc-dc, dc-ac, ac-dc and ac-ac converters. This course also aims to apply the mathematical skills to a number of practical / design problems. Practical application of typical converters will be presented to the students as case study.</p> | | | |
| COURSE TEACHING AND LEARNING ACTIVITIES | | | (Add more rows) |
| S.No. | Week/Contact Hours | Topic | Mode of Delivery |
| 1 | Week 4 to Week 6 21 st August to 8 th September 8 contact hours | Analysis of power semiconductor switched circuits with R, L, RL, RC and RLC loads, d.c. motor load, battery charging circuit. | Lecture - C&T and PPT |
| 2 | Week 7 to Week 9 12 th September to 30 th September 8 contact hours | Single-Phase and 3-Phase AC to DC converters - half controlled configurations - operating domains of 3-phase full converters and semi-converters – Reactive power considerations. | Lecture - C&T and PPT |



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|---|---|--|-----------------------|
| 3 | Week 10 to Week 12 3 rd October to 20 th October 8 contact hours | Assessment 1 in Week 11 Analysis and design of DC to DC converters - Control of DC-DC converters, Buck converters, Boost converters, Buck-Boost converters, and Cuk converters | Lecture - C&T and PPT |
| 4 | Week 13 to Week 15 25 th October to 10 th November 8 contact hours | Single phase and Three phase inverters, Voltage source and Current source inverters, Voltage control and harmonic minimization in inverters. | |
| 5 | Week 16 to Week 18 14 th November to 2 nd December 8 contact hours | Assessment 2 in Week 16 AC to AC power conversion using voltage regulators, choppers and cyclo-converters, consideration of harmonics, introduction to Matrix converters. | |
| 6 | Week 19 4 th December to 8 th December | Compensation Assessment (CPA) | |
| 6 | Week 20 / 21 11 th December to 18 th December | Final Assessment | --- |

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

| S.No. | Mode of Assessment | Week/Date | Duration | % Weightage |
|-------|--|--|-------------|-------------|
| 1 | Assessment 1 | Week 11 | 75 minutes | 25 |
| 2 | Assessment 2 | Week 16 | 75 minutes | 25 |
| 3 | Assessment 3: Seminar / case study / design work | Details will be informed during the course | | 10 |
| CPA | Compensation Assessment | Week 19 | 75 minutes | 25 |
| 4 | Assessment 4: Final Assessment | During Week 20 or Week 21 | 120 minutes | 40 |

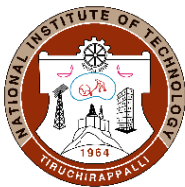
COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students during class committee meetings
Anonymous feedback through questionnaire

COURSE POLICY (including compensation assessment to be specified)

Assessment

1. Attending all the assessments (except CPA) are MANDATORY for every student.



2. If any student is not able to Assessment 1 and / or Assessment 2 due to genuine reasons, student is permitted to attend the compensation assessment (CPA) with 25 % weightage (25 marks). At any case, CPA will not be considered as an improvement test.
3. Relative grading will be based on the clusters (range) of the total marks scored for grading by adopting Gap theory / Normalized curve. Letter grades and the corresponding grade points will be as per institute norms.
4. Suggestion (if any) from Performance Analysis Committee / Office of the Dean (Academic) on the assessment / grading will be honoured with intimation to the students.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

1. All the students are advised to check their NITT WEBMAIL regularly.
2. Queries (if required) may be emailed to me / contact me during 4.00 pm to 5.00 pm on Monday with prior intimation for any clarifications

FOR APPROVAL

Course Faculty Sumarasan CC- Chairperson Janki 25/8/23 HOD [Signature] 30/8/23