Class Schedule - Fall 2019

Electrical and Computer Engineering

ECE 498  **Special Topics in ECE**  credit: 0 TO 4 hours.
Subject offerings of new and developing areas of knowledge in electrical and computer engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 0 to 4 undergraduate hours. 0 to 4 graduate hours. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>72067</td>
<td>Lecture</td>
<td>EC3</td>
<td>03:00 PM - 04:20 PM</td>
<td>TR</td>
<td>3020 - Electrical &amp; Computer Eng Bldg</td>
<td>Chitambar, E</td>
</tr>
</tbody>
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Credit Hours: 3 hours
Quantum Info Processing Theory
Not intended for Graduate - Urbana-Champaign.
This course introduces the basic concepts and principles of quantum computing and quantum communication theory. Roughly 20% of the course will be devoted to teaching the necessary mathematical tools of quantum information processing, 30% to quantum computing, 40% to quantum communication, and 10% to device-independent quantum information theory. The specific topics covered in this course are chosen to reflect areas of high interest within the research community over the past two decades. By the end of the semester, the student should be equipped with enough background and technical skill set to begin participating in quantum information research. Required: MATH 286 or introductory course in linear algebra. Recommended: ECE 487 or introductory course in quantum mechanics, ECE 313 or introductory course in probability/statistics.

| 72068 | Lecture| EC4     | 03:00 PM - 04:20 PM   | TR   | 3020 - Electrical & Computer Eng Bldg | Chitambar, E |

Credit Hours: 4 hours
Quantum Info Processing Theory
Not intended for Graduate - Urbana-Champaign.
This course introduces the basic concepts and principles of quantum computing and quantum communication theory. Roughly 20% of the course will be devoted to teaching the necessary mathematical tools of quantum information processing, 30% to quantum computing, 40% to quantum communication, and 10% to device-independent quantum information theory. The specific topics covered in this course are chosen to reflect areas of high interest within the research community over the past two decades. By the end of the semester, the student should be equipped with enough background and technical skill set to begin participating in quantum information research. Required: MATH 286 or introductory course in linear algebra. Recommended: ECE 487 or introductory course in quantum mechanics, ECE 313 or introductory course in probability/statistics.

| 72069 | Lecture| ECG     | 03:00 PM - 04:20 PM   | TR   | 3020 - Electrical & Computer Eng Bldg | Chitambar, E |

Credit Hours: 4 hours
Quantum Info Processing Theory
Not intended for Undergrad - Urbana-Champaign.
This course introduces the basic concepts and principles of quantum computing and quantum communication theory. Roughly 20% of the course will be devoted to teaching the necessary mathematical tools of quantum information processing, 30% to quantum computing, 40% to quantum communication, and 10% to device-independent quantum information theory. The specific topics covered in this course are chosen to reflect areas of high interest within the research community over the past two decades. By the end of the semester, the student should be equipped with enough background and technical skill set to begin participating in quantum information research. Required: MATH 286 or introductory course in linear algebra. Recommended: ECE 487 or introductory course in quantum mechanics, ECE 313 or introductory course in probability/statistics.

| 72087 | Lecture| JA      | 11:00 AM - 11:50 AM   | MWF  | -                               | Allen, J    |
Neural Circuits & Systems
Not intended for Graduate - Urbana-Champaign.
Neuroscience is the study of how neurons work. The mathematics of neuroscience have reached a level that it can fill a 3 hr course at the third year undergraduate level. This material is important for students who are interested in artificial neural networks and machine learning. The mathematics of neuroscience is a good training ground for extended the techniques of artificial neural networks and novel extensions of machine learning. Prerequisites: ECE 310, One of MATH 284, 285, or 286 (differential equations).

Deep Learning in Hardware
Not intended for Graduate - Urbana-Champaign.
This course will present challenges in implementing deep learning algorithms on resource-constrained hardware platforms at the Edge such as wearables, IoTs, autonomous vehicles, and biomedical devices. Fixed-point requirements of deep neural networks and convolutional neural networks including the back-prop based training will be studied. Algorithm-to-architecture mapping techniques will be explored to trade-off energy-latency-accuracy in deep learning digital accelerators and analog in-memory architectures. Fundamentals of learning behavior, fixed-point analysis, architectural energy and delay models will be introduced in just-in-time manner throughout the course. Case studies of hardware (architecture and circuit) realizations of deep learning systems will be presented. Homeworks will include a mix of analysis and programming exercises in Python and Verilog leading up to a term project. Prerequisites: ECE 313 and ECE 342.