


INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति

Yerpedu-Venkatagiri Road, Yerpedu Post, Tirupati District, Andhra Pradesh - 517 619

1.	Title of the course	Electrochemical Energy Storage
2.	Course number	CH518L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	New
5.	To be offered by	Chemical Engineering
6.	Prerequisite	CoT
7.	Course Objective(s): To discuss the principles of electrochemical energy storage devices. To discuss various types of batteries and capacitors, performance characteristics, and their applications.	
8.	Course Content: Introduction: carbon neutrality, sustainability, government policies, and role of electrochemical energy storage devices on carbon neutrality. Electrochemical cell: half-cell reactions and electro motive force (emf), Nernst equation, Butler-Volmer equation, theories of double layer models, electrochemical losses; Electrochemical Storage: primary and secondary batteries, mechanism and principles of Li-ion batteries; design, capacity, and energy density calculations; state of charge (SOC) and state of health (SOH), thermal run away and safety, factors affecting the battery performance; Redox flow batteries: zinc-bromine and vanadium redox flow battery; Next-generation batteries; Introduction to capacitors: electric double layer capacitor (EDLC), pseudocapacitor, supercapacitor, and hybrid capacitor; Applications in electric vehicles; Recycling of spent energy storage devices.	
9.	Textbook(s): 1. Bard A J, and Faulkner L R, Electrochemical Methods and Applications, 3rd Edition, John Wiley & Sons (2001). 2. Huggins R, Energy Storage, 10th Edition, Springer (2014).	
10.	Reference(s): 1. Linden D, Reddy T, Handbook of Batteries, 3rd Edition, McGraw-Hill Professional (2001). 2. Bockris J O M, and Reddy A K N, Modern Electrochemistry, 2nd Edition, Springer New York (2007). 3. Braun A, Electrochemical Energy Systems: Foundations, Energy Storage and Conversion, De Gruyter (2018). 4. Moseley P T, and Garche J, Electrochemical Energy Storage for Renewable Sources and Grid Balancing, Elsevier (2014).	