Programme: B.Tech. (ECE, CSE, CCE) Year: 4th Semester : I

**Course code: Green Communication and Networking**

Course : Core/Program/Open/HSS/Science/Math : **Open** Credits :3 Hours : 42

**Course Context and Overview (100 words):**

Reduction of energy consumption is becoming a major concern in wired networking, because of the potential economical benefits and of its expected environmental impact. These issues, usually referred to as “green networking”, relate to embedding energy-awareness in the design, in the devices and in the protocols of networks.

**Prerequisites Courses:**

Computer Network

**Course outcomes(COs):**

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| **On completion of this course, the students will have** |
| CO1:knowledge of definition, taxonomy and need of Green Networking |
| CO2 the ability to use analytical measuring systems for measuring and assessment of environmental impact in terms of CO2-emissions and assess energy load with green network/IT and green operations. |
| CO3 the ability to understand energy saving mechanism for back bone networks and data centers |
| CO4 understand energy saving mechanism for data center. |
| CO5 understand state of the art of current research trends and practices for Green energy enabler technologies and protocols. |

**Course Topics:**

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| --- | --- | --- |
| **Topics** | **Lecture Hours** | |
| **UNIT - I**   1. **Basic definitions and concepts** | **7** |  |
| 1.1 Definition of Green Networking | 1 |  |
| * 1. Why Save Energy? How to measure and save energy. | 2 |
| * 1. Taxonomy of Undertaken Approaches for Green Energy | 4 |
| **UNIT - II**   1. **Energy Efficient architecture** | **10** |  |
| * 1. Green routing in core networks: from theory to practice. | 4 |
| * 1. Energy Consumption modeling from device to network level | 6 |
| **UNIT - III**   1. **Speed Scaling in practice** | **7** |  |
| * 1. Speed scaling basics Computer architecture techniques for power-efficiency | 2 |
| * 1. Algorithmic thinking about speed scaling | 2 |
| * 1. Power Nap: Eliminating server idle power | 1 |
| * 1. Optimality, fairness, and robustness in speed scaling designs | 2 |
| **UNIT - IV**   1. **Energy saving in backbone networks** | **9** |  |
| * 1. Greening the Switch | 1 |
| * 1. A Sustainable Performance/Energy Trade-Off Approach. for Measuring Minimum Transmission Resources in the Internet Access Router | 2 |
| * 1. Reducing network energy consumption via sleeping and rate-adaptation | 2 |
| * 1. Greening the Optical Backbone Network: A Traffic Engineering Approach. | 2 |
| * 1. Decomposing the Energy Consumption | 2 |  |
| **UNIT-V**   1. **Energy reduction in data centers** | **6** |  |
| * 1. Energy reduction in content distribution from the data center to end user. | 3 |
| * 1. Energy-Efficient Data Center : New infrastructures, Server Consolidation, SDN as a key enabler of the energy efficiency | 3 |
| **UNIT-VI**   1. **Energy-efficient protocols case study and Global activities** | **10** |  |
| * 1. Introduction | 2 |
| * 1. Case study 1. The cloud      1. Promoting the Cloud      2. Cloud services eco-system      3. Wireless cloud energy trends      4. Interactive cloud services | 2 |
| * 1. Case study 2. Content distribution: IPTV      1. IPTV over the public Internet | 1 |
| * 1. Case study 3. The Internet of Things | 2 |
| * 1. Global activities in green networking | 2 |  |
| * 1. Unified Architecture for Energy Efficiency Evaluation (3E) | 2 |  |

**Textbook references (IEEE format):**

**Text Book:**

Minoli, Daniel (2011), “Designing Green Networks and Network Operations”, CRC Press, ISBN 978143986387

F. Richard Yu, Xi Zhang, Victor C.M. Leung ," Green Communications and Networking , December, 2012

**Reference books:**

Shafiullah Khan, Jaime Lloret Mauri, "Green Networking and Communications: ICT for Sustainability", CRC Press, 2013

**Additional Resources (Web resources etc.):**

**Evaluation Methods:**

|  |  |
| --- | --- |
| Item | Weightage |
| Quiz | 10 |
| Assignment | 10 |
| Term Paper | 20 |
| Midterm | 20 |
| Final Examination | 40 |

**Prepared By: Course Instructor name**

**Last Update: ­­\_\_\_\_\_\_\_\_**