

GRID COMPUTING

Subject Code: CS35222CS	Subject Type: DE (Elective-2)	Evaluation Scheme: MSE (30), TA (20), ESE (50)	L-T-P: 3-0-0 (3)
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Pre-Requisites: Distributed systems, C/C++/Java/Python, Computer network

Course Objective: To understand how to create a Virtual Organization (VO), a temporary or permanent alliance of individuals and institutions that share resources to achieve a common goal.

Course Outcomes: At the end of the course, the student will be able to

CO	Course Outcomes
CO-1	Understand the fundamental principles of grid computing and explain the layered architecture of the Grid Protocol.
CO-2	Design and apply security measures using GSI (Grid Security Infrastructure) and digital certificates to ensure secure resource sharing.
CO-3	Compare different grid middleware (e.g., Globus, gLite) and select the appropriate tools for specific large-scale computational problems.
CO-4	Build or deploy a functional grid service that solves a complex scientific or business problem.

Syllabus:

Unit-1: Foundation of Grid Computing

Introduction, Anatomy and Physiology of the Grid, Grid vs. Cluster Computing, Grid vs. Cloud Computing, The Grid Protocol Architecture (Fabric, Connectivity, Resource, Collective, and Application layers), Open Grid Services Architecture (OGSA) and Open Grid Services Infrastructure (OGSI).

Unit-2: Grid Monitoring & Resource Management

Overview of monitoring systems (R-GMA, GridICE, MDS), Ganglia, Hawkeye, and Network Weather Service (NWS), Local Schedulers (Condor, PBS, LSF, SGE), Principles of Gridway and Gridbus Broker, Scheduling with Quality of Service (QoS).

Unit-3: Grid Security & Virtualization

Grid Security Infrastructure (GSI), PKI, X.509 Certificates, and Grid Security Primer, Trust models, CAS (Community Authorization Service), and Identity Management, Role of Virtual Machines (VMs) and Containers in Grid environments, Resource isolation, and abstraction.

Unit-4: Data Grids & Middleware Tools

GridFTP for high-speed transfer, Replica Management, and Metadata catalogs, Comprehensive study of the Globus Toolkit (architecture and components like GRAM and MDS), User interfaces for job submission and monitoring.

Learning Resources:

Text Books:

1. Joshy Joseph, Craig Fellenstein, Grid Computing, IBM Press, 2003.
2. Barry Wilkinson, Grid Computing: Techniques and Applications, Chapman & Hall/CRC Press, 2009.