



Course Syllabus  
Gyanmanjari College of Computer Application  
Semester-I(MCA)

**Subject:** Grid Computing - MCACT11506

**Type of course:** Minor Stream (MS)

**Prerequisite:** Programming fundamental, logic and problem-solving skill, mathematical logic

**Rationale:**

Grid computing is a distributed architecture of multiple computers connected by networks to accomplish a joint task. These tasks are compute-intensive and difficult for a single machine to handle. Several machines on a network collaborate under a common protocol and work as a single virtual supercomputer to get complex tasks done. This offers powerful virtualization by creating a single system image that grants users and applications seamless access to IT capabilities. The Key components of grid computing are:

1. **User Interface:** A grid portal offers an interface that enables users to launch applications with resources provided by the grid. A grid user views a single, large virtual computer offering computing resources, similar to an internet user who views a unified instance of content on the web.
2. **Security:** Security is one of the major concerns for grid computing environments. Security mechanisms can include authentication, authorization, data encryption, and others. Grid security infrastructure (GSI) is an important ingredient here. It outlines specifications that establish secret and tamper-proof communication between software entities operating in a grid network.
3. **Scheduler:** A scheduler may not be needed if standalone tasks are to be executed that do not showcase interdependencies. However, if you want to run specific tasks concurrently that require inter-process communication, the job scheduler would suffice to coordinate the execution of different subtasks.
4. **Data management:** Data management is crucial for grid environments. It offers a data management component called grid access to secondary storage (GASS). It includes GridFTP built on the standard FTP protocol and utilizes GSI for user authentication and authorization. After authentication, the user can move files using the GridFTP facility without going through the login process at every node.

Overall, Grid computing is a powerful and important concept through which we can achieve complete security of the data, manage the larger tasks by distributing the tasks amongst the grids, and we can also achieve other parameters like User interface, management of workload and resources, scheduling of the tasks etc.



**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	0	3	60	30	10	0	50	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Case Studies</b> Case Studies will be provided to students, which they will analyze and solve the given questions. The answers of the question will be submitted in the Moodle.	10
2	<b>Snowball</b> A practical program of the respective subject will be shared to the students by the faculty, which they have to analyze and think of an issue in the program given to them and submit the issue in the Moodle. (Group of 3 students)	10
3	<b>Assignment</b> Some tricky theoretical and practical question will be given to the students. The answers of the assignment questions have to be shared on Moodle. Per unit maximum 3 questions will be allocated to the students.	10
4	<b>MCQ</b> A list of MCQ questions will be given to the students for which they have to select the correct answer and submit on the Moodle. Per unit maximum 5 questions will be allocated to the students.	10
5	<b>Pro-Con Grids</b> The students will pick a topic of their choice and list pros and cons of the respective topic and submit the answers in the Moodle.	5
6	<b>Index Card Pass</b> The students will generate different type of questions regarding to the topic of their interest and they will submit the questions in the Moodle. Minimum 5 questions must be generated per student.	5
Total		50



**Course Content:**

Sr. No	Contents	Unit No	Approx. Hours Required	Weightage (%)
1	<b>Introduction to Grid Computing:</b> What is Grid Computing? Benefits of Grid Computing, Classification of Grid computing, Grid Applications, Grid Computing Projects, Grid Software Components, Business and e-Commerce Grid.	1	04	10
2	<b>Synchronization Protocols in Grid Environment:</b> Introduction, Token Based Mutual Exclusion Algorithm, Mutual Exclusion Algorithm for large configuration, Composition Approach to Mutual Exclusion, Composition Properties, Performance Evaluation	2	05	10
3	<b>Technologies and Architectures in Grid Computing:</b> Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids	3	05	5
4	<b>World Wide Grid Computing Activities, Organization and Project:</b> Standard Organizations, Organizations Developing Grid Computing Tool Kits, Framework and Middleware, Grid Projects and organization building, and using grid based solutions, Commercial Organization building and using grid based solutions	3	05	5
5	<b>Web Services and Service Oriented Architecture (SOA):</b> History and background, Service Oriented Architecture, How a web service works, SOAP and WSDL, Creating Web Services, Server Side.	4	06	5
6	<b>OGSA (Open Grid Service Architecture) and WSRF:</b> OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification	4	05	5
7	<b>The Grid and the Databases:</b> Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the Databases with the Grid?, The Architecture of	5	06	10

	OGSA-DAI for Offering Grid Database Services			
8	<b>Globus Toolkit:</b> History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4-Cases, GT4-Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data, Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers	5	06	10

**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom’s Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	25 %	40%	35%	10	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course the students should be able to:	
CO1	Understand about grid computing is and its concepts and where it is applicable.
CO2	Gain basic knowledge of the architecture, standards, elements and services of grid computing
CO3	Implement the virtualization techniques.
CO4	Demonstrate the concepts of grid middleware packages using Globus Toolkit.
CO5	Interpret the security models in the grid environment..



**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction. Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory The internal evaluation will be done on the basis of Active Learning Assignment

**Reference Books:**

- [1] Grid Computing: Making the global infrastructure a reality By Fran Berman, Geoffrey C. Fox, Anthony J.G. Hey, Wiley Publication, England, 2003, ISBN: 10 0-470-85319-0(HB)
- [2] Introduction to Grid Computing By Frederic Magoules. Taylor & Francis, Delhi, 2009, ISBN: 9781420074062, 1420074067
- [3] Grid Computing, Joshy Joseph, Craig Fellenstein, New Delhi; 2020: Dorling Kindersley (licences of Pearson), Delhi, 2007, ISBN: 978-81-317-0885-9

