Vidya Pratishthan's
Kamalnayan Bajaj Institute of Engineering and Technology, Baramati.
(An Autonomous Institute)

Faculty of Science and Technology

Board of Studies

Computer Engineering

Syllabus

Multidisciplinary Minor

(Pattern 2023)
(w.e.f. AY: 2024-25)

Syllabus: Multidisciplinary Minor Mechanical Engineering

(Pattern 2023) w.e.f. AY:2024-2025

SEMESTER-III,IV,V,VI,VII

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	T UT	Activity	ISE	ESE	TW	PR	OR	Total	TH	PR	T UT	Total
CO23051	Cloud Computing	2	2		20	20	50	20			110	2	1		3
CO23052	High Performance Computing	2	2		20	20	50	20			110	2	1		3
CO23053	Computer Graphics & Gaming	2	2		20	20	50	20			110	2	1		3

Dept. Autonomy Coordinator
Mr. M. D. Shelar

Academic Coordinator
Dr. P. M. Paithane

Head of Department
Dr. G. J. Chhajed

Dean Autonomy
Dr. C. B. Nayak

Dean Academic
Dr. S. M. Bhosle

Principal
Dr. S. B. Lande

VPKBIET BARAMATI
Affiliated to S. P. P. U. Pune
Id No. / PU / PN / Engg / 152 / 2008
PUNE (MS.)

Principal
Vidya Pratishthan's
Kamalnayan Bajaj Institute of
Engineering & Technology, Baramati
Vidyanagari, Baramati-413133

CO23051 : Cloud Computing

Teaching Scheme	Credit: 03	Examination Scheme:
TH:02Hrs/Week	TH Credit :02	Course Activity: 20Mark
PR:02Hrs/Week	PR Credit :01	In-Semester :20 Mark
		End-Semester :50 Mark
		Term work :20 Mark

Prerequisite: Computer Network, Database management System, Computer Organization

Course Objective:

- To study fundamental concepts of cloud computing
- To understand scaling & services in cloud computing
- To understand goals & challeges in cloud computing
- To learn administrations & storage in cloud computing

Course Outcomes: Articulate

1. Summarize fundamental concepts of cloud computing.
2. Explain the concepts scaling & services in cloud computing
3. Explain the goals & challenges in cloud computing
4. Explain the administrations & storage in cloud computing

Course Activity :

The course coordinator should identify relative and innovative activities for course activity. Below are some suggested course activity for course coordinator

1. Poster Presentation
2. Seminar Presentations
3. Survey on various cloud computing making tools
4. Industry Visit
5. Group Discussion

Course Contents

Mapping of Course Outcomes for Unit I	CO1	
UNIT I	**Introduction to Cloud Computing**	**07 Hours**

Origins and Influences, Brief History, Definition, Characteristics, Use cases, Technology Innovations, Technology Innovations vs. Enabling Technologies, Cloud, IT Resource, On-Premise, Types of Cloud, Cloud Consumers, Cloud Providers, Business Drivers, Capacity Planning, Cost Reduction, Organizational Agility

Mapping of Course Outcomes for Unit II	CO2	
UNIT II	**Cloud Computing Scaling & Services**	**07 Hours**

Scaling, Horizontal Scaling, Vertical Scaling, Cloud Service Models, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Cloud Service Consumer, Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Virtual Machines Provisioning and Manageability

Mapping of Course Outcomes for Unit III	CO3	
UNIT III	**Cloud Computing Goals & Challenges**	**06 Hours**

Goals and Benefits, Reduced Investments and Proportional Costs, Increased Scalability, Increased Availability and Reliability, Risks and Challenges, Increased Security Vulnerabilities, Reduced Operational Governance Control, Limited Portability Between Cloud Providers, Multi-Regional Compliance and Legal Issues, Pros and Cons of Cloud Computing

Mapping of Course Outcomes for Unit IV	CO4	
UNIT IV	Cloud Computing Administrations & Storage	08 Hours

Roles and Boundaries, Cloud Provider, Cloud Consumer, Cloud Service Owner, Cloud Resource Administrator, Additional Roles, Organizational Boundary, Trust Boundary, Cloud Characteristics On-Demand Usage, Ubiquitous Access, Multitenancy (and Resource Pooling), Elasticity, Measured Usage, Resiliency, Cloud Storage: Direct Attached Storage, Storage Area Network, Network Attached Storage, Cloud Data Stores, Data Management, Provisioning Cloud storage

Books and Other Resources

Text Books:

1. "Cloud Computing Concepts, Technology & Architecture", Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, PRENTICE HALL
2. "Cloud Security A Comprehensive Guide to secure Cloud Computing", Ronald L. Krutz, Russell Dean Vines, Wile

Reference Books:

1. " Cloud Computing: A Practical Approach for Learning and Implementation", A. Srinivasan, J. Suresh, Pearson, ISBN: 978-81-317-7651-3
2. " Mastering Cloud Computing" Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education, ISBN-13:978-1-25-902995-

Guidelines for Term Work Assessment :

Term work assessment will be based on overall performance of Laboratory assignments performed by a students.

Guideline for Practical Conduction :

Use of open source software is encouraged. Based on the concepts learned. Instructor may also set one assignment that is suitable to respective branch beyond the scope of syllabus.
Operating System recommended :- 64-bit Open source Linux or its derivative, Windows
Programming tools recommended: - Python

Practical Assignments

1.	To Study of cloud service providers (aws, google & Microsoft-azure).
2.	To demonstrate Infrastructure as a service using cloud service provider.
3.	To demonstrate Software as a service using cloud service provider.
4.	To demonstrate Platform as a service using cloud service provider
5.	To demonstrate Storage as a service using cloud service provider.
6.	To make spreadsheet and notes using Google Drive
7.	Installation of VMWARE workstation & access the tools.

CO23052 : High Performance Computing

Teaching Scheme		Credit: 03		Examination Scheme	
TH:	02 Hrs/Week	Theory:	02	Activity:	10
PR:	02 Hrs/Week	Oral:	01	End-Semester:	60
				Oral:	30

Prerequisite: Computer Organization, Microprocessor, Problem Solving, Computer Network, Operating System

Course Objective:

- To understand different parallel programming models
- To illustrate the various techniques to parallelize the algorithm
- To understand the parallel communication and performance parallel programs
- To discriminate CUDA Architecture and its components.

Course Outcomes:

CO1: **Understand** the basics of Parallel Architecture and Models
CO2: **Design** of simple parallel programming models
CO3: **Calculation** of communication cost and performance of parallel models
CO4: **Implementation** of parallel program using CUDA Architecture

Course Activity (Any one) :

- Presentation on Pipelining in Computer Organization
- Case Study of NVIDIA GPU used in ChatGPT / Gemini Design
- Industrial Visit to Intel to understand the High-End Processors

Course Contents

Mapping of Course Outcomes for Unit I	CO1

UNIT I	Introduction to Parallel Computing	07 Hours

Introduction to Parallel Computing: Stored-program computer architecture, General-purpose Cache-based Microprocessor architecture. Parallel Programming Platforms: Implicit Parallelism, Physical Organization of Parallel Platforms, Levels of parallelism, **Models**: SIMD, MIMD, SIMT, SPMD Architectures: Superscalar architectures, N-wide Superscalar architecture

Mapping of Course Outcomes for Unit II	CO2

UNIT II	Parallel Algorithm design	07 Hours

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, **Parallel Algorithm Models**: Data, Task, Work Pool and Master Slave Model, Anomalies in Parallel Algorithms.

Mapping of Course Outcomes for Unit III	CO3

UNIT III	Parallel Communication and Performance Measure	08 Hours

Basic Communication: One-to-All Broadcast, All-to-One Reduction, All-to-All Broadcast and reduction, All-Reduce and Prefix-Sum Operations, Collective Communication using MPI: Scatter, Gather, Broadcast, Blocking and non-blocking MPI

Performance Measures and Analysis: Amdahl's and Gustafson's Laws, Speedup Factor and Efficiency, Cost and Utilization, Execution Rate and Redundancy, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost.

Mapping of Course Outcomes for Unit IV		CO4
UNIT IV	**CUDA Architecture**	**06 Hours**

Introduction to GPU: Introduction to GPU Architecture overview, Introduction to CUDA C- CUDA programming model, write and launch a CUDA kernel, Handling Errors, CUDA memory model, Manage communication and synchronization, Parallel programming in CUDA- C.

Books and Other Resources

Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2. John Cheng, Max Grossman, and Ty McKercher, "Professional CUDA C Programming", John Wiley & Sons, Inc., ISBN: 978-1-118-73932-7

Reference Books:

1. Kai Hwang,, "Scalable Parallel Computing", McGraw Hill 1998
2. Jason sanders, Edward Kandrot, "CUDA by Example", Addison-Wesley, ISBN-13: 978- 0-13-138768-3

NPTEL Course

1. https://nptel.ac.in/courses/106108055

Guidelines for Term Work Assessment :

Term work assessment will be based on overall performance of Laboratory assignments performed by students. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, efficient codes, and punctuality.

Guidelines for Practical Examination :

Problem statements will be formed based on assignments and performance will be evaluated by Internal and External Examiner. During practical assessment, maximum weightage should be given to satisfactory knowledge of the practical concepts required to implement it and implementation style. Relevant questions may be asked at the time of evaluation to test the student's understanding of the practical fundamentals and implementation platform

Guidelines for Laboratory Conduction :

Operating System recommended :- 64-bit Open source Linux or its derivative Programming Languages: **Object Oriented Languages** C++/JAVA/PYTHON/R

Practical Assignments

1. Design and implement Parallel Breadth First Search on existing algorithms using Open MP.
2. Write a program to implement Parallel Bubble Sort using OpenMP.
3. Implement Min, Max, and Sum and Average operations using Parallel Reduction.
4. Write a CUDA Program for Matrix Multiplication using CUDA C
5. Implement Huffman Coding on GPU (Group Assignment in group of 3 Students)

CO23053: Computer Graphics and Gaming		
Teaching Scheme: TH:02Hrs/Week PR:02Hrs/Week	**Credit: 03** **TH Credit :02** **PR Credit :01**	**Examination Scheme:** Course Activity :20Marks In Semester :20Marks End Semester :50Marks Term-Work :20Marks

Prerequisite:

C++ programming (CPP)

Companion Course, if any: Computer Graphics Laboratory

Course Objective:

1. Remembering: To acquaint the learner with the basic concepts of Computer Graphics
2. Understanding: To learn the various algorithms for generating and rendering graphical figures.
3. Applying: To get familiar with mathematics behind the graphical transformations
4. Understanding: To understand and apply various methods and techniques regarding animation.
5. Creating: To generate Interactive graphics using OpenGL

Course Outcomes:

Students will be able to

1. Be familiar with the graphics designing concepts and devices.
2. Construct a mathematical design using the development process.
3. Recognize the design principles of animation and gaming application.
4. Implement the use of gaming tools in application design.

Course Activity :

The course coordinator should identify relative and innovative activities for course activity. Below are some suggested course activity for course coordinator

6. Active participation in Gaming Competition
7. Poster Presentation
8. Video Presentations
9. Survey on various Animation making tools
10. Visit to Animation Business Schools

Course Contents

Mapping of Course Outcomes for Unit I		CO1
UNIT I	**Basics of Computer Graphics**	**07 Hours**

Introduction, What is computer Graphics? Area of Computer Graphics, Design and Drawing, Animation Multimedia applications, Simulation, How are pictures actually stored and displayed, Difficulties for displaying pictures. Graphics Devices Cathode Ray Tube, Quality of Phosphors, CRTs for Color Display, Beam Penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, Tablets, The light Pen, Three Dimensional Devices.

Mapping of Course Outcomes for Unit II		CO2
UNIT II	**Two and Three Dimensional Transformations**	**07 Hours**

Simple line drawing methods, Introduction Point Plotting Techniques Qualities of good line drawing algorithms The Digital Differential Analyzer (DDA), Bresenham's Algorithm Generation of Circles Introduction, what is transformation? Matrix representation of points Basic transformation, Translation, Rotation, Scaling, Need for 3-Dimensional Imaging Techniques for 3-Dimesional displaying, Translation, Rotation, Scaling

Mapping of Course Outcomes for Unit III	CO3

UNIT III	Animation	07 Hours

Animation: Introduction, Conventional and computer-based animation, Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility. Design of animation sequences, Animation languages, Key- frame, Morphing, Motion specification. Gaming: Introduction, Gaming platform (NVIDIA, i8060), Advances in Gaming.

Mapping of Course Outcomes for Unit IV	CO4

UNIT IV	Gaming	07Hours

Principles of game design, Game Design Theory,MDA,8 type of Fun in Game, Visual style, Gameplay, Generate ideas for a game concept Idea Development Process, Stimulus, Genre Market Research, Target platform ,Creating Prototype Creating physical Games: Board Game, Card Game, Party Games and etc....

Books and Other Resources

TextBooks:

1. Computer Graphics, Multimedia and Animation ,2010, Pakhira Malay K.
2. Donald D. Hearn and Baker- Computer Graphics with OpenGL, 4th Edition, ISBN-13: 9780136053583

Reference Books:

3. J. Foley, V. Dam, S. Feiner, J. Hughes, —Computer Graphics Principles and Practice‖, 2nd Edition,Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
4. D. Rogers, J. Adams, —Mathematical Elements for Computer Graphics‖, 2nd Edition, Tata McGrawHill Publication, 2002, ISBN 0 – 07 – 048677 – 8.

Guidelines for Term Work Assessment :

Term work assessment will be based on overall performance of Laboratory assignments performed by a students.

Guideline for Practical Conduction :

Use of open source software is encouraged. Based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.
Operating System recommended :- 64-bit Open source Linux or its derivative, Windows
Programming tools recommended: - Open Source C++ Programming tool like G++/GCC, OPENGL, DEV C++.

Guidelines for Practical Examination :

Problem statements will be formed based on assignments and performance will be evaluated by Internal and External Examiner. Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals, effective and efficient implementation.

Practical Assignments

1.	Write C++ program to draw the line styles using DDA and Bresenham's algorithm
2.	Write C++ program to draw a 4X4 chessboard.
3.	Write C++ program to draw 2-D object and perform following basic transformations, a) Scaling b) Translation c) Rotation.
4.	Write C++ program to draw Man Walking in the Rain with an Umbrella.
5.	Write a C++ Program to make puzzle game.
6.	Write a C++ Program to make Tic Tac Toe game.
7.	Write a C++ Program to draw a car in motion.