# SYLLABUS

**SUBJECT 1:**

**YEAR - IV**

**SEMESTER – VIII**

**SUBJECT CODE – 191CS832**

**SUBJECT TITLE – GREEN COMPUTING**

UNIT - I : FUNDAMENTALS

Green IT Fundamentals: Business, IT, and the Environment, Green computing: carbon foot print, scoop on power, Green IT Strategies: Drivers, Dimensions, and Goals, Energy-Saving Software Techniques,Environmentally Responsible Business: Policies, Practices, and Metrics

UNIT - II : GREEN ASSETS AND MODELING

Green Assets: Buildings, Data Centers, Networks, and Devices, Green Business Process Management: Modeling, Optimization, and Collaboration, Green Enterprise Architecture, Environmental Intelligence, Green Supply Chains, Green Information Systems: Design and Development Models.

UNIT - III : GRID FRAMEWORK

Socio-cultural aspects of Green IT, Green Enterprise Transformation Roadmap,Green Compliance: Protocols, Standards, and Audits, Emergent Carbon Issues: Technologies and Future.

UNIT - IV : GREEN COMPLIANCE

Socio-cultural aspects of Green IT, Green Enterprise Transformation Roadmap,Green Compliance: Protocols, Standards, and Audits, Emergent Carbon Issues: Technologies and Future.

UNIT - V : CASE STUDIES

The Environmentally Responsible Business Strategies (ERBS), Case Study Scenarios for Trial Runs, Case Studies, Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS :

1.BhuvanUnhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press.

2.Woody Leonhard, Katherine Murray, "Green Home computing for dummies", August 2012.

## SUBJECT – 2

## SYLLABUS OF INFORMATION THEORY AND CODING

## SUBJECT CODE – 191CS833

## SUBJECT TITLE – INFORMATION THEORY AND CODING

UNIT - I : INFORMATION ENTROPY FUNDAMENTALS

Uncertainty, Information and Entropy, Source coding Theorem, Huffman coding, Shannon Fano coding, Discrete Memory less channels, channel capacity, channel coding Theorem, Channel capacity Theorem.

UNIT - II  : DATA AND VOICE CODING

Differential Pulse code Modulation, Adaptive Differential Pulse Code Modulation, Adaptive subband coding, Delta Modulation, Adaptive Delta Modulation, Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT – III : ERROR CONTROL CODING

Linear Block codes, Syndrome Decoding, Minimum distance consideration, cyclic codes, Generator Polynomial, Parity check polynomial, Encoder for cyclic codes, calculation of syndrome, Convolutional codes.

UNIT – IV : COMPRESSION TECHNIQUES

Principles, Text compression, Static Huffman Coding, Dynamic Huffman coding, Arithmetic coding, Image Compression, Graphics Interchange format, Tagged Image File Format, Digitized documents, Introduction to JPEG standards.

UNIT – V : AUDIO AND VIDEO CODING

Linear Predictive coding, code excited LPC, Perceptual coding, MPEG audio coders, Dolby audio coders, Video compression, Principles, Introduction to H.261 & MPEG Video standards.

TEXT BOOKS :

1.SimonHaykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Pearson Education Asia, 2002.

## SUBJECT – 3

**SYLLABUS OF MULTICORE ARCHITECTURE AND PROGRAMMING**

**SUBJECT CODE – 191CS834**

**SUBJECT TITLE – MULTICORE ARCHITECTURE AND PROGRAMMING**

UNIT – I : MULTI-CORE PROCESSORS

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design.

UNIT – II : PARALLEL PROGRAM CHALLENGES

parallel architectural classification schemes-speedup performance laws- - Program and Network Properties-H/WS/W Parallelism - Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT – III : SHARED MEMORY PROGRAMMING WITH OpenMP

shared memory model – message passing model - OpenMP Execution Model – Memory Model — OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations.

UNIT – IV : DISTRIBUTED MEMORY PROGRAMMING WITH MPI

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT – V : PARALLEL PROGRAM DEVELOPMENT

 Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.- parallel simulations – parallel programming environment

TEXT BOOKS :

1. Peter S. Pacheco, ―An Introduction to Parallel Programming‖, Morgan-Kauffman/Elsevier, 2011.

2. Darryl Gove, ―Multicore Application Programming for Windows, Linux, and Oracle Solaris‖, Pearson, 2011 (unit 2)

# SUBJECT – 4

**SYLLABUS OF PROFESSIONAL ETHICS IN ENGINEERING**

**SUBJECT CODE – 191CS801**

**SUBJECT TITLE – PROFESSIONAL ETHICS IN ENGINEERING**

**UNIT – I : HUMAN VALUES**

Morals, values and Ethics, Integrity, Work ethic, Service learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self confidence, Character, Spirituality, Introduction to Yoga and meditation for professional excellence and stress management, Auditing Standards, Statements and Guidance Notes – An Overview, Audit Planning, Strategy and Execution.

UNIT – II : ENGINEERING ETHICS

Senses of Engineering Ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Models of professional roles, Theories about right action, Self-interest, Customs and Religion, Uses of Ethical Theories.

UNIT – III : ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law.

UNIT – IV : SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination.

UNIT – V : GLOBAL ISSUES

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as

Expert Witnesses and Advisors, Moral Leadership, Code of Conduct, Corporate Social Responsibility,Case Studies for role morality

TEXT BOOKS :

1.Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

2.Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

# SUBJECT – 5

## SYLLABUS OF GPU ARCHITECTURE AND PROGRAMMING

## SUBJECT CODE – 191CS831

## SUBJECT TITLE – GPU ARCHITECTURE AND PROGRAMMING

UNIT – I : GPU ARCHITECTURE

Evolution of GPU architectures, Understanding Parallelism with GPU, Typical GPU Architecture, CUDA Hardware Overview, Threads, Blocks, Grids, Warps, Scheduling, Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.CASE STUDY: Applications of GPU Architecture like Gaming, Computer Vision, etc.

UNIT – II : CUDA PROGRAMMING

Using CUDA, Multi GPU, Multi GPU Solutions, Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT – III : PROGRAMMING ISSUES

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues,Finding and Avoiding Errors.

UNIT – IV : OPENCL BASICS

Introduction to OpenCL – OpenCL Device Architectures – Basic OpenCL – examples – Understanding OpenCL – Concurrency and Execution Model – Dissecting a CPU/GPU – OpenCL Implementation – OpenCL.

UNIT – V : ALGORITHMS ON GPU

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster.

TEXT BOOKS :

1.Shane Cook, CUDA Programming: "A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing)", First Edition, Morgan Kaufmann, 2012.

2.David R. Kaeli, PerhaadMistry, Dana Schaa, Dong Ping Zhang, "Heterogeneous computing with OpenCL", 3$^{rd}$ Edition, Morgan Kauffman, 2015.

# SUBJECT – 6

## SYLLABUS OF PARALLEL ALGORITHMS

## SUBJECT CODE – 191CS831

## SUBJECT TITLE – PARALLEL ALGORITHMS

### UNIT – I : INTRODUCTION

Need for Parallel Processing, Data and Temporal Parallelism, Models of Computation, RAM and PRAM Model, Shared Memory and Message Passing Models, Processor Organizations, PRAM Algorithm, Analysis of PRAM Algorithms, Parallel Programming Languages.

### UNIT – II : PRAM ALGORITHMS

Parallel Algorithms for Reduction, Prefix Sum, List Ranking, Preorder Tree Traversal, Searching, Sorting, Merging Two Sorted Lists, Matrix Multiplication, Graph Coloring, Graph Searching.

### UNIT – III : SIMD ALGORITHMS -I

2D Mesh SIMD Model, Parallel Algorithms for Reduction, Prefix Computation, Selection, Odd-Even Merge Sorting, Matrix Multiplication.

### UNIT – IV : SIMD ALGORITHMS -II

Hypercube SIMD Model, Parallel Algorithms for Selection, Odd-Even Merge Sort,Bitonic Sort, Matrix Multiplication Shuffle Exchange SIMD Model, Parallel Algorithms for Reduction, Bitonic Merge Sort, Matrix Multiplication, Minimum Cost Spanning Tree.

### UNIT – V : MIMD ALGORITHMS

MIMD Architecture, Structure of shared memory and distribution memory architecture in MIMD Architecture, UMA Multiprocessor Model, Parallel Summing on Multiprocessor, Matrix Multiplication on Multiprocessors and Multi-computer, Parallel Quick Sort, Mapping Data to Processors.

TEXT BOOKS :

1. Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.

2. V Rajaraman, C Siva Ram Murthy, " Parallel computers- Architecture and Programming ", PHI learning, 2016.

3. Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition, 2011.