SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	GPU Computing				
Subject Code	MCSDS20S301				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. The course aims to give an overview of an important trend in high performance computing – GPU programming.

2. To use of GPUs for computationally intensive mathematical and scientific computing.

3. The course will help the students in understanding the basic concepts of GPU programming, CUDA (Compute Unified Device Architecture) parallel computing platform and hands-on experience on implementing some standard CUDA programs.

Course Outcomes:

After completion of course, students would be:

CO1. Learn concepts in parallel programming.

CO2. Implementation of programs on GPUs.

CO3. Debugging and profiling parallel programs.

CO4. Develop an efficient parallel algorithm to solve it.

CO5. Implement an efficient and correct code to solve it, analyze its performance.

Unit	Syllabus	Periods
UNIT - I	**Introduction**: History, Graphics Processors, Graphics Processing UNIT-s, and GDATA SCIENCEPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA Open CL / Open ACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wave fronts, Thread blocks / Workgroups, Streaming.	**12**
UNIT - II	**Memory**: Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories.	**10**
UNIT - III	**Synchronization**: Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Work lists, Linked-lists. Synchronization across CPU and GPU. **Functions**: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.	**12**
UNIT - IV	**Support**: Debugging GPU Programs. Profiling, Profile tools, Performance aspects **Streams**: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based-Synchronization - Overlapping data transfer and kernel execution, pitfalls.	**12**
UNIT - V	**Case Studies**: Image Processing, Graph algorithms, Simulations, Deep Learning. Advanced topics: Dynamic parallelism, Unified Virtual Memory, Multi-GPU processing, Peer access, Heterogeneous processing.	**12**

TEXT BOOKS:

1. Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-mei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722).

REFERENCE BOOKS:

1. Computer Vision: Algorithms and Applications, Richard Szeliski, Springer International, 2011.
2. Concise Computer Vision: An introduction into theory and Algorithms, Reinhard Klette, 2014, Springer-Verlag London.
3. R. Hartley and A. Zisserman, Multiple View Geometry in Computer Vision, Cambridge University Press, 2003.
4. Computer vision – A modern Approach, David A forsyth & Jean ponce, Prentice Hall, 2002.
5. "Computer vision and Applications", Bernd Jahne and Horst Hau Becker Academic press, 2000.

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	Cloud Computing				
Subject Code	MCSDS20S302				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcomes:

After completion of course, students would be able to:
CO1. Identify security aspects of each cloud model.
CO2. Develop a risk-management strategy for moving to the Cloud.
CO3. Implement a public cloud instance using a public cloud service provider.
CO4. Apply trust-based security model to different layer.
CO5. Analyze various cloud programming models and apply them to solve problems on the cloud.

Unit	Syllabus	Periods
UNIT – I	**Introduction to Cloud Computing** Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing.	8
UNIT – II	**Cloud Computing Architecture** Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model. **Cloud Deployment Models** Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise.	12
UNIT – III	**Security Issues in Cloud Computing** Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security. **Identity and Access Management** Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management.	12
UNIT – IV	**Security Management in the Cloud** Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS. **Privacy Issues** Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations.	12
UNIT – V	**Audit and Compliance** Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud Recent developments in hybrid cloud and cloud security.	10

TEXT BOOKS:
1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski: "Cloud Computing: Principles and Paradigms", Wiley, 2011.

REFERENCE BOOKS:
1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2, 2009.
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765, O'Reilly Media, September 2009.

SCHOOL OF ENGINEERING

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	Distributed Database				
Subject Code	MCSDS20S303				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems.
2. Introduce basic principles and implementation techniques of distributed database systems.
3. Expose active and emerging research issues in distributed database systems and application development.
4. Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

Course Outcomes:

After completion of course, students would be:

CO1. Abel to understand relational database management systems, normalization to make efficient retrieval from database and query.

CO2. Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case.

CO3. Be aware of the current research directions in the field and their possible outcomes.

CO4. Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions.

CO5. Be able to apply learned skills to solving practical database related tasks.

Unit	Syllabus	Periods
UNIT - I	Introduction: Distributed Data processing, Distributed database system (DDBMS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs, Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data Languages, Relational DBMS.	**12**
UNIT - II	Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture. Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation. Semantic Data Control: View Management, Data security, Semantic Integrity Control.	**12**
UNIT - III	Overview of Query Processing: Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing. Introduction to Transaction Management: Definition of Transaction, Properties of transaction, types of transaction. Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.	**14**
UNIT - IV	Parallel Database Systems: Database servers, Parallel architecture, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture.	**10**
UNIT - V	Distributed Object Database Management systems: Fundamental Object concepts and Object models, Object distribution design. Architectural issues, Object management, Distributed object storage, Object query processing. Transaction management. Database Interoperability: Database Integration, Query processing. Recent approaches, models and current trends in improving the performance of Distributed Database.	**12**

TEXT BOOKS:
1. Principles of Distributed Database Systems, Fourth Edition M. Tamer Özsu Patrick Valduriez Springer ISBN 978-3-030-26252-5 2020.

REFERENCE BOOKS:

1. Distributed Databases principles and systems, Stefano Ceri, Giuseppe Pelagatti, Tata McGraw Hill.

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	Business Analytics				
Subject Code	MCSDS20S304				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course objective:

1. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.

2. To become familiar with the processes needed to develop, report, and analyze business data.

3. To learn how to use and apply Excel and Excel add-ins to solve business problems.

Course Outcomes:

After completion of course, students would be:

CO1. Able to have knowledge of various business analysis techniques.

CO2. Understand and critically apply the concepts and methods of business analytics.

CO3. Identify, model and solve decision problems in different settings.

CO4. Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.

CO5. Create viable solutions to decision making problems.

Unit	Syllabus	Periods
UNIT - I	Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.	**12**
UNIT - II	Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.	**10**
UNIT - III	Forming Requirements: Overview of Requirements Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents.	**10**
UNIT - IV	Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling.	**12**
UNIT - V	Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools. Recent Trends in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.	**10**

TEXT BOOKS:

1. Fundamentals of Business Analytics Paperback – 1 January 2011 by R.N. Prasad (Author), Seema Acharya (Author).
2. Essentials of Business Analytics Paperback – 1 April 2015 by Jeffrey D Camm (Author).

REFERENCE BOOKS:

1. Business Analysis by James Cad leetal.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray.

SCHOOL OF ENGINEERING

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	Industrial Safety				
Subject Code	MCSDS20S305				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:
The objective of this course is to impart knowledge on different facets and aspects of engineering systems safety, focusing on tools, techniques and methodologies needed for prevention of occurrences of unsafe operations and accidents under different industrial settings.

Course Outcomes:
Upon completion of the course The students will be able to.

CO1. Equipped with concepts of engineering systems safety, dimensions of engineering systems safety, safety design.
CO2. Analysis mathematics.
CO3. Design for engineering systems safety.
CO4. Control for safety.
CO5. Integrating safety with other operational goals such as quality and reliability.

Unit	Syllabus	Periods
UNIT - I	Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.	10

UNIT - II	Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	**10**
UNIT - III	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	**12**
UNIT - IV	Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic ,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	**12**
UNIT - V	Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.	**14**

TEXT BOOKS:
1. Industrial Safety Management System (English, Paperback, Raj Kishore Ojha).
2. Handbook of Occupational Safety and Health 3rd Edition by S. Z. Mansdrof.

REFERENCE BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winter korn, Hans, Chapman &Hall London.

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	3	-	-	3
Subject Name	Operations Research				
Subject Code	MCSDS20S306				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:
1. To impart knowledge in concepts and tools of Operations Research.
2. To understand mathematical models used in Operations Research.
3. To apply these techniques constructively to make effective business decisions.

Course Outcomes:

At the end of the course, the student should be able to

CO1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.

CO2. Students should able to apply the concept of non-linear programming.

CO3. Students should able to carry out sensitivity analysis.

CO4. Student should able to model the real world problem and simulate it.

CO5. Solve Linear Programming Problems.

Unit	Syllabus	Periods
UNIT - I	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.	8
UNIT - II	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.	8

UNIT - III	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.	8
UNIT - IV	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	10
UNIT - V	Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation	10

TEXT BOOKS:

1. Operations Research—Introduction to Management Science Paperback – 1 January 2019 by A Panel of Authors (Author).
2. Operations Research Paperback – 1 January 2015 by D S HIRA, P K GUPTA (Author).

REFERENCE BOOKS:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008.
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009.
5. Pannerselvam, Operations Research: Prentice Hall of India 2010.

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	III/II	-	-	20	10
Subject Name	Dissertation I				
Subject Code	MCSDS20S307				
Paper	English				
	Hindi				
Max. Marks	250				

Course Objective:

1. To undertake a substantial in-depth study of a specific topic in Computer Science, Software Engineering, Data Science.

Course Outcomes:

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

CO1. Identify Computer Science engineering problems reviewing available literature.
CO2. Identify appropriate techniques to analyse complex Computer Science systems.
CO3. Apply engineering and management principles through efficient handling of project.

Syllabus

- Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
- End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution.
- Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

SYLLABUS

DATA SCIENCE

Class	M.TECH. – DS	L	T	P	C
Semester/Year	IV/II	-	-	32	16
Subject Name	Dissertation II				
Subject Code	MCSDS20S401				
Paper	English				
	Hindi				
Max. Marks	500				

Course Objective:
Extension of the work on the topic identified in Dissertation – I.

Course Outcomes:
At the end of the course, the student will be able to:
CO1. Solve complex Computer Science problems by applying appropriate techniques and tools.
CO2. Exhibit good communication skill to the engineering community and society.
CO3. Demonstrate professional ethics and work culture.

Syllabus

Dissertation – II will be extension of the work on the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.