UTKAL UNIVERSITY

Syllabus with Programme and Course Objectives and Outcomes

for

Master of Technology in

Computer Science (M. Tech (CS))

(2-Years Programme)

Department of Computer Science & Applications
Utkal University
Bhubaneswar (Odisha)

2021-22

UTKAL UNIVERSITY

Syllabus for Masters of Technology in Computer Science (M. Tech (CS))

(Applicable for Students Taking Admission from the Session 2021-22)

Objective of the Programme

The objective of the M. Tech curriculum is to equip the students with the ability to analyze varieties of real-life problems and develop research based solutions. Keeping in view the research and development requirements of the evolving software industry and also to provide a foundation for higher studies in Computer Science, effort has been made in the choice of subjects to balance between theory and practical aspects of Computer Science. On successful completion of this course a student can find a career in the Academics or R&D wing of Corporate Sectors, or Government Organizations as a technical professional or pursue research in the core areas of Computer Science.

Syllabus for Masters of Technology in Computer Science(M. Tech (CS))				
PAPER ID	**PAPER TITLE**	**FULL MARK**		**CREDIT**
		Mid-Term	**End-Term**	
FIRST SEMESTER				
MT-1.1	Discrete Mathematics	30	70	4
MT-1.2	Data Structure & Algorithm Design	30	70	4
MT-1.3	Advanced Computer Architecture	30	70	4
MT-1.4	Advanced Computer Network	30	70	4
MT-1.5	Elective-I	30	70	4
MT-1.6	Elective-II	30	70	4
MT-1.7	Unix & C Programming Lab		50	2
MT-1.8	Data Structure & Algorithm Lab		50	2
MT-1.9	Computer Network Lab		50	2
SECOND SEMESTER				
MT-2.1	Theory of Computation	30	70	4
MT-2.2	Advanced Operating System	30	70	4
MT-2.3	Database Engineering	30	70	4
MT-2.4	Advanced Software Engineering	30	70	4
MT-2.5	Elective-III	30	70	4
MT-2.6	Elective-IV	30	70	4
MT-2.7	Operating System Lab		50	2
MT-2.8	Database Lab		50	2
MT-2.9	Software Engineering Lab		50	2
THIRD SEMESTER				

MT-3.1	Machine Learning	30	70	4
MT-3.2	Parallel & Distributed Computing	30	70	4
MT-3.3	Research Methodology	30	70	4
MT-3.4	Cryptography & Network Security	30	70	4
MT-3.5	Elective-V	30	70	4
MT-3.6	Elective-VI	30	70	4
MT-3.7	Machine Learning Lab		50	2
MT-3.8	Network Security Lab		50	2
MT-3.9	Seminar & Technical Writing		50	2
FOURTH SEMESTER				
MT-4.1	Comprehensive Viva	50		2
MT-4.2	Dissertation	300*		12
	Total	**2600**		**104**

List of Elective Papers #

Elective-I	
MT-1.5(1)	Computer Graphics & Multimedia
MT-1.5(2)	Mathematics for Data Science
MT-1.5(3)	Digital Signal Processing
MT-1.5(4)	Combinatorics & Graph Theory
MT-1.5(5)	Soft Computing
Elective-II	
MT-1.6(1)	Probability & Statistics
MT-1.6(2)	Simulation & Modeling
MT-1.6(3)	Network Programming
MT-1.6(4)	Cyber Security
MT-1.6(5)	Bio Informatics
Elective-III	
MT-2.5(1)	Wireless Sensor Networks
MT-2.5(2)	Information Theory & Coding
MT-2.5(3)	Computational Geometry
MT-2.5(4)	Stochastic Modeling & Analysis
MT-2.5(5)	Quantum Computing
Elective-IV	
MT-2.6(1)	Data Warehousing & Mining
MT-2.6(2)	Mobile Computing
MT-2.6(3)	Cloud Computing
MT-2.6(4)	Digital Image Processing
MT-2.6(5)	Social Network Analysis
Elective-V	
MT-3.5(1)	Internet of Things
MT-3.5(2)	Distributed Database System
MT-3.5(3)	VLSI Design
MT-3.5(4)	Computational Complexity
MT-3.5(5)	Software Defined Networks
Elective-VI	

MT-3.6(1)	Big Data Analytics
MT-3.6(2)	Human Computer Interaction
MT-3.6(3)	Block Chain Technology
MT-3.6(4)	Speech & Natural Language Processing
MT-3.6(5)	Intrusion Detection Systems

* **Mark Distribution for Dissertation:**
Report (200), Presentation (50), Viva Voce (50)

 # A student can opt for only one paper from among the papers mentioned under the respective elective groups

N.B. Students may opt at most two elective papers from SWAYAM/NPTEL courses during the programme.

MT-1.1: DISCRETE MATHEMATICS

Objective:

The course objective is to provide students with an overview of discrete mathematics. Students will learn about topics such as logic and proofs, propositional Logic, predicate logic, algebraic structure, graph theory, matrices and other important discrete math concepts.

Learning Outcomes:

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

- Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction**.**
- Use tree and graph algorithms to solve problems.

MT-1.2: DATA STRUCTURE AND ALGORITHM DESIGN

Objective

The course is designed to develop skills to design and analyze simple linear and nonlinear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.

Learning Outcomes:

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

- Be able to design and analyze the time and space efficiency of the data structure·
- Be capable to identity the appropriate data structure for given problem·
- Have practical knowledge on the applications of data structures.

MT-1.3: ADVANCED COMPUTER ARCHITECTURE

Objective:

The aim of this module is to emphasize on the concept of a complete system consisting of asynchronous interactions between concurrently executing hardware components and device driver software in order to illustrate the behavior of a computer system as a whole.

Learning Outcomes:

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

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non-pipelining environment in a processor

MT-1.4: ADVANCED COMPUTER NETWORKS

Objective:

This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

Learning Outcome:

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

- Recognize the technological trends of Computer Networking.
- Discuss the key technological components of the Network.
- Evaluate the challenges in building networks and solutions to those.

MT-2.1: THEORY OF COMPUTATION

Objectives:

To introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.

Learning Outcomes:

At the end of the course students will be able to:

- Use basic concepts of formal languages of finite automata techniques
- Design Finite Automata's for different Regular Expressions and Languages
- Construct context free grammar for various languages
- Solve various problems of applying normal form techniques, push down automata and Turing Machines

MT-2.2: ADVANCED OPERATING SYSTEM

Objective:

The aim of this module is to study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems); Hardware and software features that support these systems.

Learning Outcome:

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

- Outline the potential benefits of distributed systems
- Summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security
- Apply standard design principles in the construction of these systems
- Select appropriate approaches for building a range of distributed systems, including some that employ middleware

MT-2.3: DATABASE ENGINEERING

Objective:

- To explain basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations.
- Describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases.
- To facilitate students in Database design
- To familiarize issues of concurrency control and transaction management.

Learning Outcome:

At the end of the course the students are able to:

- Apply the basic concepts of Database Systems and Applications.
- Use the basics of SQL and construct queries using SQL in database creation and interaction.

- Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
- Analyze and Select storage and recovery techniques of database system

MT-2.4: ADVANCED SOFTWARE ENGINEERING

Objective:

To provide an advanced understanding and knowledge of the software engineering techniques, techniques to collect software requirements from client and CASE tools and to understand the importance of these case tools in software development.

Learning Outcome:

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

- Analyze the software life cycle models.
- Identify the importance of the software development process.
- Analyze the importance of CASE tools.
- Design and develop correct and robust software products using advanced software engineering techniques.
- Able to understand business requirements pertaining to software development.

MT-3.1: MACHINE LEARNING

Objective:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research.

Learning Outcome:

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

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

- Be able to design and implement various machine learning algorithms in a range of real-world applications.

MT-3.2: PARALLEL & DISTRIBUTED COMPUTING

Objective:

- Learn about parallel and distributed computers.
- Write portable programs for parallel or distributed architectures using Message-Passing Interface (MPI) library
- Analytical modeling and performance of parallel programs.
- Analyze complex problems with shared memory programming with OpenMP

Learning Outcome:

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

- Develop and apply knowledge of parallel and distributed computing techniques and methodologies.
- Apply design, development, and performance analysis of parallel and distributed applications.
- Use the application of fundamental Computer Science methods and algorithms in the development of parallel applications.
- Explain the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.

MT-3.3: RESEARCH METHODOLOGY

Objective:

- To familiarize participants with basic of research and the research process.
- To enable the participants in conducting research work and formulating research synopsis and report.
- To familiarize participants with Statistical packages such as SPSS/EXCEL.
- To impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the business/Research problem.

Learning Outcome:

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

- Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.

- Have basic knowledge on qualitative research techniques
- Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis
- Have basic awareness of data analysis-and hypothesis testing procedures

MT-3.4: CRYPTOGRAPHY & NETWORK SECURITY

Objective:

- Learn fundamentals of cryptography and its application to network security.
- Understand network security threats, security services, and countermeasures.
- Acquire background on well-known network security protocols such.
- Understand vulnerability analysis of network security.

Learning Outcome:

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

- Understand various Cryptographic Techniques
- Apply various public key cryptography techniques
- Implement Hashing and Digital Signature techniques
- Implement system level security applications